

ANIMAL DAMAGE CONTROL HANDBOOK

CHAPTER 50 - DESCRIPTIONS OF THE SPECIES AND THEIR CONTROL

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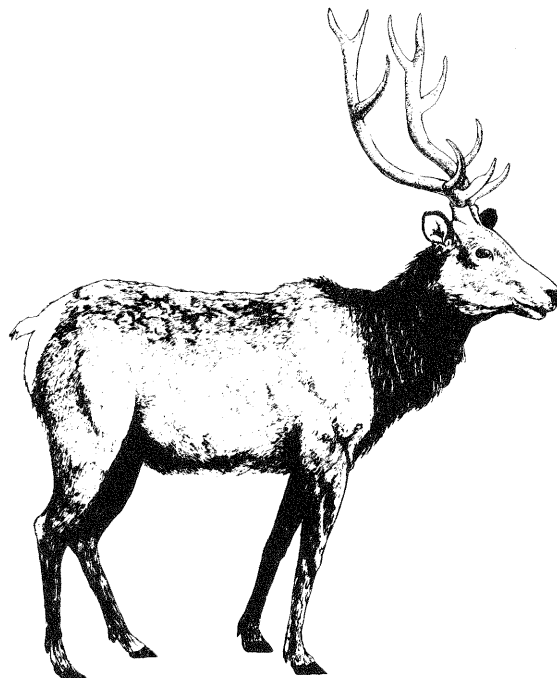
CHAPTER 50 - DESCRIPTION OF THE SPECIES AND THEIR CONTROL

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This chapter contains information pertinent to identifying problem species, understanding how a species relates to its environment, and methods of controlling unwanted wildlife use.

51 - BIG-GAME ANIMALS51.1 - Herbivores51.11 - Roosevelt Elk, Wapiti
(Cervus canadensis roosevelti)

The Roosevelt elk is the largest subspecies of North American elk. Mature bulls weigh 700-1,000 pounds (318-454 kg) and mature cows 400-700 pounds (182-318 kg). The antlers of the Roosevelt elk are generally shorter, less symmetrical, more massive, and have a narrower spread than the antlers of the Rocky Mountain elk. The winter coat is heavy with dark brown coloring on head, neck, and legs. The sides are a much lighter grayish-brown, and a large rump patch is whitish-yellow in color. The summer coat is more reddish brown.



1. **Economic Significance.** The Roosevelt elk of the Pacific slopes of Washington and Oregon are highly valued both by sportsmen and by those who wish only to observe and photograph the animals. About 8,000 Roosevelt elk are harvested annually in Washington and Oregon.

In certain areas, feeding damage constitutes an important loss in forest plantations. Plantation damage also may occur when elk trample young trees.

2. **Life History Information**

a. **Preferred Habitat.** Roosevelt elk generally range west of the Cascade Crest in Oregon and Washington. They favor forest ranges that provide a mosaic of young and mature stands, interspersed with grassy openings and narrow stream-side meadows. During summer, elk in the Olympic Mountains and on the west slopes of the Cascade Range in Oregon and Washington may migrate to high mountain meadows.

Optimum habitat contains about 60 percent cover, gentle southerly or flat exposures, and a free-running water source, all in close proximity.

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b. **Feeding Habitats.** Shrubs, forbs, grasses, and grasslike plants are all eaten readily at some period of the year. Elk use of Douglas-fir varies with season and availability of other food materials. Succulent new growth on Douglas-fir is frequently eaten even when there is an abundance of other food. Western hemlock occasionally constitutes a major food in winter. Elk generally feed upslope in steep country. Roosevelt elk seldom feed more than 200 yards (183 m) from suitable hiding or escape cover.

c. **Activity.** Roosevelt elk are most active just before dawn and again in late afternoon. Daytime activity increases during winter, when food is less abundant. Home ranges average about 2-4 square miles (500-1,000 ha) for nonmigratory populations. Migratory populations follow the receding snow to summer ranges at higher elevations. Most elk return each year to the same wintering area. Roosevelt elk normally feed over a large circular route, moving slowly through each feeding area and then moving on. A typical small band of elk makes a complete circuit of its feeding area in about 2 or 3 weeks.

d. **Reproduction.** Roosevelt elk are polygamous. Most breeding takes place between September 15 and October 15. Most yearling bulls are capable of breeding. Preseason populations have 2-10 percent antlered bulls. On good range, females usually breed during the second fall after birth. The gestation period is from 8 to 8-1/2 months, and calves are dropped from mid-May through June. Less than 1 percent of births are twins. Cows in the wild are believed to be capable of bearing young for about 10 years. The average fertility rate of adult cows in western Oregon and Washington is considerably lower than that of the Rocky Mountain elk in western Oregon and Washington. Lactating cows are frequently in such poor physical condition that fewer than half of the lactating cows in most herds become pregnant. Most cows with calves are still lactating during the breeding season. Studies have shown that 75-85 percent of dry cows and all cows in areas with high-quality forage are capable of conceiving.

The mean annual population increase depends on many factors, with quality of forage, herd density, and age structure being most important. Herds are capable of increasing at a rate of 25-40 percent per year.

3. Damage Problems and Their Control

a. **Identification.** Elk, possessing lower incisors only, leave a splintered break on browsed, dormant woody stems. Spring browsing may cause the bark to slip from the browsed twig, resulting in a stripped stem below the break. Small, newly planted seedlings are occasionally pulled out by elk, especially in loose, sandy or pumice soils. Elk also bark shrubs and small deciduous trees, particularly willow and cottonwoods. Elk damage areas are often related to movement patterns. Elk usually travel in small bands, making well-defined trails. They bed most often on gentle slopes, benches, or ridgetops.

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b. **Determining Need for Damage Control.** Although use of clearcuttings by Roosevelt elk is heaviest 6-8 years after logging (Harper 1971), severe damage to coniferous seedlings may occur immediately after planting on recent clearcuttings. Moderate to heavy browsing damage may occur throughout stand establishment and continue until terminal shoots of Douglas-fir saplings are out of reach of the elk. Elk prefer to feed in the vicinity of bedding areas, and damage may be concentrated near them.

A survey such as the Reforestation Stocking Survey (Form R6-2470-105) should be made to gather information to evaluate degree of use by elk. Browsing of 20 percent or less of the terminal shoots is usually not significant enough to warrant control, because the plantation can sustain the effects of such browsing without serious growth loss. Some plantations can be adequately protected by treating only those areas preferred by elk that are on gentle to moderate slopes.

As in most damage situations, the best predictive information can be found by evaluating adjacent areas with similar conditions and history.

c. **Control Methods**

(a) **Hunting.** Ensuring adequate harvest by sport hunting is a desirable method of alleviating plantation damage by Roosevelt elk. Increased elk damage to plantations often may be related to habitat deterioration. Downward trends in the condition of big-game habitat must be brought to the attention of the appropriate regulatory agency (Washington Department of Game or Oregon Department of Fish and Wildlife) that regulates hunting and of the public that does the hunting. This is good land and wildlife management (See 43.1).

(b) **Silvicultural Modifications.** Leave logged areas unburned to restrict elk access and provide more forage for elk. When planting on wintering areas, plant as late in the spring as is consistent with other reforestation practices; use large planting stock (24-30 inches (61-76 cm) high), plant seedlings in spots protected by slash or other obstructions, and plant seedlings a minimum of 8 feet (2.4 m) from well-used elk trails. On steep hillsides, plant in or above debris piles (see 45.5).

(c) **Habitat Manipulation.** Consider forage, fertilization, supplemental-food development, or improvement of forage species composition to lessen impact of elk damage to planted trees (see 45).

(d) **Area Protection.** Properly constructed, 8-foot high, woven-wire fences will exclude elk. Resource managers must, however, consider the problems involved in fencing portions of National Forest lands (see 46.1).

(e) **Individual Plant Protection.** Use plastic tubing or bud caps on the minimum number of trees desired for the site (see 31, 46.34).

(f) **Repellents.** BGR can be used to supply short-term protection (see 42.1).

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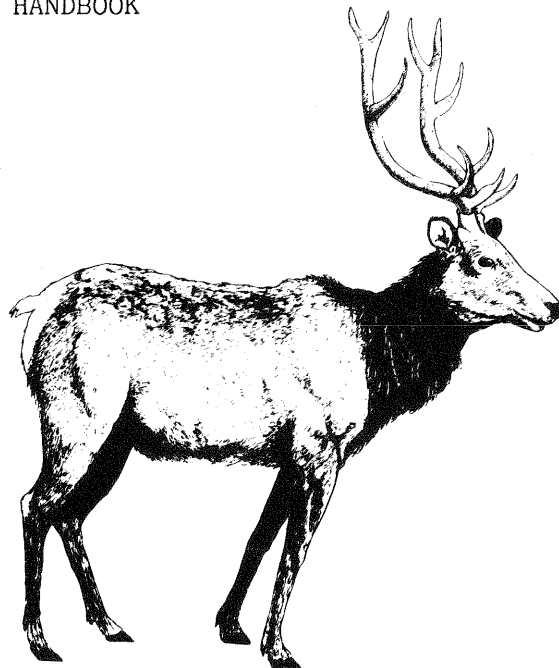
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51.12 - Rocky Mountain Elk, Wapiti
(Cervus elaphus nelsoni)

1. **Description.** A large member of the deer family with a pale yellow rump patch, small tail, and reddish brown body, elk can weigh up to 1,000 pounds. Males have huge, spreading antlers. Cows are much smaller rarely weighing more than 600 lbs.

2. **Economic Significance.** The Rocky Mountain elk is one of the most prized game animals. Money spent in its pursuit provides a substantial source of income to local communities that furnish services and supplies. About 16,000 Rocky Mountain elk were harvested in Oregon and Washington in 1976.



In some areas, elk depredations cause serious economic losses to ranchers. When forced by hunger, elk do not hesitate to use orchards and haystacks to supplement their diets.

Few conflicts occur between Rocky Mountain elk and other resources on National Forest lands. Range and watershed problems occur locally when populations are allowed to exceed carrying capacity. Rocky Mountain elk may cause problems in forest regeneration.

3. Life History Information

a. **Preferred Habitat.** Rocky Mountain elk are found throughout much of the timbered mountainous area east of the Cascade Mountains in Oregon and Washington. Favored habitat includes meadows and grasslands for feeding and dense timber for cover. Optimum habitat contains a ratio of about 40 percent cover to 60 percent forage areas, with gentle terrain and free-running water available during the summer.

Areas disturbed by fire or logging usually support a diversity of vegetation, and are attractive to elk. A good distribution of escape cover is needed to make these areas more desirable.

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b. **Feeding Habits.** Grasses and sedges form the basic diet, but significant quantities of forbs and browse are used seasonally. During the spring and early summer, succulent grasses, sedges, and forbs make up the major portion of the diet of Rocky Mountain elk. As grasses and sedges cure during late summer and early fall, the diet shifts to shrub species, which stay succulent longer. Wintering can occur on open bunchgrass or shrub ranges, as the highly adaptable elk will utilize the food source that is most readily available. The two daily feeding periods are in the morning--from just before, to several hours after daylight--and in the early evening. Winter feeding periods are more frequent and erratic.

c. **Activity.** Elk normally cover several miles a day while feeding during the spring, summer, and fall. In winter, they are more sedentary and will feed heavily in one area before moving to another.

Migration from summer to winter range usually takes place in late November and December. Some routes are more than 100 miles (161 km) in length, however, they are usually much shorter.

Elk are gregarious and travel in herds most of the year. Herd size is greatest from late summer through winter. Older bulls are more solitary, are often found alone, and tend to winter in higher elevations.

d. **Reproduction.** Rocky Mountain elk are polygamous. Their main breeding period is from late August through September. The gestation period is 249-262 days, with the calf drop occurring from late May to mid-June. Breeding age of cows normally begins at 2-1/2 years, although 1-1/2 year-old cows may breed. One and one-half-year-old bulls are capable of breeding, and are significant breeders in many heavily hunted populations. Most Rocky Mountain elk herds in Oregon and Washington have high calf production rates, with a 35-50 percent annual rate of increase.

4. Damage Problems and Their Control

a. Identification

(1) **Browsing.** Elk, possessing lower incisors only, leave a splintered break on browsed, dormant woody stem (Figure 20.1, 20.2). Spring browsing may cause the bark to slip from the browsed twig, resulting in a stripped stem below the break. Small, newly planted seedlings are occasionally pulled out by elk, especially on loose sandy or pumice soils. Elk also bark shrubs and small deciduous trees, particularly willow and cottonwoods, and may seriously damage plantations by trampling, particularly in loafing and bedding areas.

(2) **Grazing** use is difficult to differentiate from that of livestock. The best way to identify the impact of elk use on rangelands is by a combination of surveys. A range survey (FSH 2209.21) can be used to evaluate total forage use, and a series of pellet-group-count transects (see 32.21), which can be read once or twice a year, can be used to separate big-game use from domestic stock use.

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- ★- Elk usually travel in small bands, making well-defined trails. They bed extensively on gentle slopes, benches, or ridgetops.

b. **Determining Need for Control.** Browsing on conifers is frequently highest immediately after planting in recent clearcuttings. When forage plants become well established in a harvest unit, the amount of conifer use declines. A survey such as the Reforestation Stocking Survey (Form R6-2470-105) should be made to gather information to evaluate degree of use by elk. Browsing of 20 percent or less of the terminal shoots is usually not sufficient to warrant control, because a plantation can sustain the effects of such browsing without serious growth loss. Elk prefer to feed in the vicinity of bedding areas and damage may be concentrated near them. Some plantations can be adequately protected by treating only those areas that are on gentle to moderate slopes. Overuse by grazing is frequently caused by excessive use by both big game and domestic livestock. The type of control depends on the land-management objectives for the particular area, and the ability to implement control practices. In some instances, because of political pressures, it may be necessary to revise established land-management objectives to protect the basic forage resource.

As in most damage situations, the best predictive information can be found by evaluating adjacent areas having similar conditions and history.

c. **Control Methods**

(1) **Hunting.** Ensuring adequate harvest by sport hunting is a desirable method of alleviating damage by elk. Increased elk damage to plantations or forage areas often may be related to habitat deterioration. Downward trends in the condition of big-game habitat must be brought to the attention of the appropriate regulatory agency (Washington State Game Department or Oregon Fish and Wildlife Department) that regulates hunting and of the public that does the hunting. This is good land and wildlife management (see 43.1).

(2) **Silvicultural Modifications.** Leave 20-30 tons of debris on the site after site preparation. This will provide seedling protection and forage for elk. When planting on wintering areas, plant as late in the spring as is consistent with other reforestation practices, use large 2-0 planting stock, plant seedlings in spots protected by debris or other obstructions, and plant seedlings a minimum of 8 feet from well-used elk trails. On steep hillsides, plant in or above debris piles.

(3) **Habitat Manipulation.** Consider forage fertilization, supplemental food development, or improvement of forage species composition to lessen impact of elk on planted trees.

(4) **Individual Plant Protection.** Use plastic tubing or bud caps on a minimum number of trees desired for the site (see 46.31 and 46.34).

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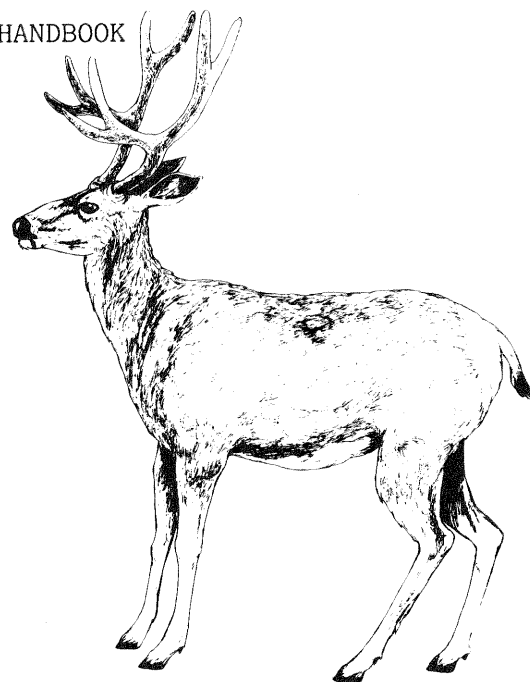
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51.13 - Mule Deer (Odocoileus hemionus)

1. **Description.** Pelage is dark gray during the fall and winter months, reddish brown in the summer. Large ears, white rump, and a short, round tail with a black tip and hairless undersurface are typical mule deer characteristics.

2. **Economic Significance.** The Rocky Mountain mule deer is the most important big game animal in Region 6, both in terms of total kill and hunter days effort. Each year many thousands of dollars are brought to Region 6 by mule deer hunters from out-of-Region.



Serious reforestation problems can occur in plantations lying within or adjacent to deer winter range. Most damage occurs from mid-fall through spring.

3. **Life History Information**

a. **Preferred Habitat.** Mule deer occur primarily east of the Cascade Mountains. They use nearly all habitat types that provide suitable food, cover, and water. Preferred topography includes open forests and broken brushlands on steep and rugged terrain.

b. **Food and Feeding.** Mule deer are primarily browsers and consume woody forage throughout the year. However, in the fall and early spring, grasses make up a significant part of their diet. Forbs are used extensively during late spring and summer.

c. **Activity.** Daily movements are from 1 to 2 miles (1.6-3.2 km) on summer range. On winter range, daily movement is much more restricted, generally about 0.25 mile (400 m), if undisturbed.

Most feeding is done in late evening and early morning; however, in winter it takes place throughout the day. Mule deer tend to be gregarious. This is particularly true during winter, when they often form groups of 10 or more.

d. **Reproduction.** Mule deer are polygamous. Breeding takes place from late October through early December. The gestation period is 196-210 days, with the fawn drop occurring in June. Most deer breed at 16 to 18 months. During the first two pregnancies, single fawns are normal; thereafter, twin births are common. The average number of fawns per doe is 1.5. Potential productivity is 50-60 percent annual increase, but net productivity seldom exceeds 20-40 percent in most herds.

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4. Damage Problems and Solutions

a. Identification

(1) **Barking.** Antler polishing by mule deer leaves the bark in a shredded condition with long-frayed shreds of bark hanging at the top and bottom of the barked area. Antler polishing is generally restricted to an area between 1-1/2 and 3-1/2 feet (46-107 cm) above the ground. Preferred targets are small, live open-grown saplings 3/4 - 1-1/2 inches in diameter (2-4 cm).

(2) **Browsing.** Deer feeding on woody vegetation leave a ragged splintered edge during the dormant season, although early spring browsing may result in the bark slipping leaving a stripped stem some distance below the break. Browsing of new growth usually leaves a clean, blunt stem-end where the tender shoots were broken off. Browsing seldom occurs more than 4 feet (1.2 m) above the ground, except in deep snow situations (see figures 20.1, 20.2).

(3) **Grazing.** Deer use of grass and forbs is best differentiated from use by domestic livestock and other ungulates by the use of pellet transects (see 32.21).

b. **Need for Control.** Antler polishing occurs sporadically and in such a manner that control is generally impractical. Browsing of less than 20 percent of the terminals is generally not a serious problem on established plantations.

The amount of deer use on rangelands that is required to constitute "damage" will depend in part on the objectives set for the area. If a combined deer-livestock overuse situation occurs and if reduction in deer or livestock use is anticipated, pellet transects can help document the amount of deer use.

c. Control

(1) **Hunting.** Controlling mule deer damage by hunting is often feasible because the animals occupy open habitat and form into groups in late fall. However, hunting should not be considered a panacea, because in preferred habitats with high deer populations tree damage may occur even though large herd reductions are made.

(2) **Silvicultural Modifications.** Leave 20-30 tons per acre of debris on the site after site preparation. When adapted to the site, plant trees with a lower preference rating than ponderosa pine or Douglas-fir. Plant as late in the spring as is consistent with other reforestation practices, when planting on or near winter range. Do not plant trees within 8 feet (2.4 m) of well-used deer trails. Practice obstruction planting (see 45.5).

(3) **Habitat Manipulation.** Consider forage fertilization, supplemental food development or improvement of forage species composition to lessen impacts on planted trees (see 45).

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(4) Area Protection. An 8-foot (2.4 m) fence will effectively protect most plantations. If plantations are located in deer migration routes or are subject to extremely heavy deer pressure, a woven wire fence should be used. Area protection has a number of disadvantages and should not be used if other protective measures will be equally effective (see 46.1).

(5) Individual Tree Protection. Tubing or using bud caps on individual trees will protect them from deer damage (see 46.31, 46.34).

(6) Repellent. BGR may be applied to seedlings in the nursery bed to provide protection during the dormant season after planting. Thiram or Caspaician can be either broadcast sprayed or directly sprayed on seedlings just prior to or during the growing season in spring. Thiram can also be used as a brush-on during the dormant season. Note label restrictions for certain geographic areas.

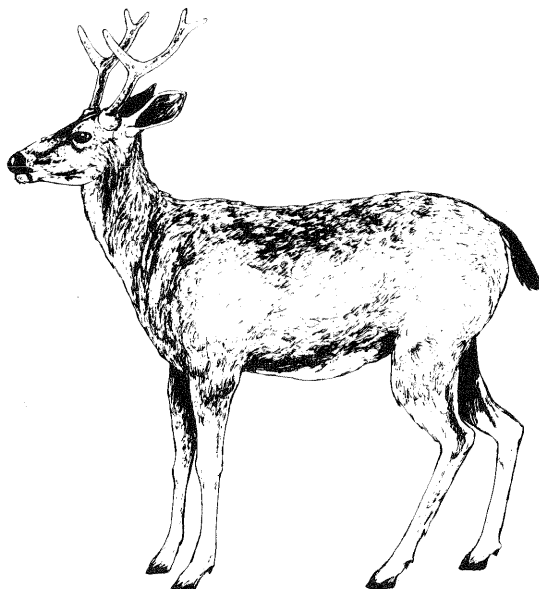
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51.14 - Black-tailed Deer
(Odocoileus hemionus columbianus)

1. Description. The black-tailed deer is smaller than the mule deer, its closest relative. Adult black-tailed does average 110-130 pounds (50-59 kg) live weight, with an occasional doe weighing up to 145 (66 kg) pounds. Adult bucks average 120-160 (54-73 kg) pounds, although an occasional buck may exceed 200 pounds (91 kg) live weight. The summer pelage is typically reddish-brown, in contrast to the winter coat, which is predominately brown to gray-brown in color. The tail is broad at the base and narrows gradually to a rounded tip. The outer surface of the tail is dark brown to black, with a white undersurface. The rump patch is not nearly as pronounced as in the typical mule deer. When startled, black-tailed deer often throw up their tail as a flag, similar to the behavior of white-tailed deer.



Antlers of black-tailed deer branch in a dichotomous manner, typical of mule deer. Antlers begin growth in April and are dropped from mid-December to March. Antlers of most yearling black-tailed deer and many 2-year-olds develop as spikes. Branched antlers are rare for yearlings, but are most common for 2- and 3-year-olds.

2. Economic Significance. The black-tailed deer is the most important game animal west of the Cascade crest, with 80-90,000 harvested annually in Washington and Oregon. It provides a unique and challenging hunting experience, and when properly dressed and prepared it is exceptionally fine eating.

Black-tailed deer are usually able to meet their year-long habitat needs within a limited area, and as a result they exert a steady pressure on both farm and forest crops. Conifer plantations are often set back up to 5 years because of heavy deer feeding. The combined tree mortality and suppression of growth results in the largest animal caused economic loss on National Forests in western Oregon and Washington.

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3. Life History Information

a. **Preferred Habitat.** Black-tailed deer range west of the crest of the Cascade Mountains in Oregon and Washington. They occupy all types of habitat, except large areas without cover, and thrive in areas of subclimax vegetation, which develop after fire or logging.

b. **Feeding Habits.** Black-tailed deer are primarily browsing animals, but they also consume a wide variety of herbaceous plants. As grasses and forbs become available, the volume of browse in the diet decreases. Use of conifers varies in relation to their abundance, location, time of year, availability of other foods, and deep population density. The feeding pattern on steep slopes is generally uphill. Black-tailed deer seldom venture more than 200 yards (183 m) from escape cover while feeding.

c. **Activity.** Daily movements are usually only a few hundred yards in extent. Many black-tailed deer are nonmigratory and spend most of their lives within an area of 1-2 square miles (1.6-3.2 km²). In the more mountainous portions of their range, in the Cascade and Olympic Ranges, black-tailed deer frequently move up to higher elevations. Migrations seldom exceeds 1 mile. Deer moving into the high Cascades migrate several miles to spend summer at upper elevations, returning in the fall to winter ranges that are usually below 2,000 feet (610 m).

d. **Reproduction.** Black-tailed deer are polygamous. Breeding takes place from late October to early December, with the peak occurring in mid-November. They usually breed as yearlings, but the greatest productivity is in the 3-1/2 to 6-1/2 year-age group. The gestation period is about 203 to 212 days. The average fawn-per-doe ratio in good habitat is about 1.2 and poor habitat is about 0.8. Black-tailed deer have reproductive rates of 35-65 percent per year, with habitat conditions having the principal control on population growth rate.

4. Damage Problems and Solutions

a. Identification

(1) **Barking.** Antler polishing by black-tailed deer leaves the bark in a shredded condition with long-frayed shreds of bark hanging at the top and bottom of the barked area. Antler polishing is generally restricted to an area between 1-1/2 and 3-1/2 feet (46-107 cm) above the ground. Preferred targets are small live saplings 3/4 to 1-1/2 inches in diameter (2-4 cm).

(2) **Browsing.** Deer feeding on woody vegetation leave a ragged, splintered stem during the dormant season, although early spring browsing may cause the bark to slip leaving a stripped stem some distance below the break. Browsing of new growth usually leaves a clean, blunt end where the tender shoots were broken off. Browsing seldom occurs more than 4 feet (1.2 m) above the ground, except in deep snow situations.

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(3) **Grazing.** Deer use of grass and forbs is best differentiated from use by domestic livestock and other ungulates by the use of pellet transects (see 32.21).

b. **Determining Need for Damage Control.** Antler polishing occurs sporadically and in such a manner that control is generally impractical. Browsing of less than 30 percent of the terminals is generally not a serious problem on established plantations.

c. **Control Methods**

(1) **Hunting.** Sport hunting to regulate black-tailed deer numbers is the most desirable, although not always the most effective method of controlling browsing damage to plantations. Deer population levels that can be maintained without causing damage to other forest resources must be determined from a knowledge of local habitat conditions and deer use patterns. Obtaining a harvest that will produce a desired population level is primarily the result of coordination with the State Game Department and the hunting public. Roads into the problem areas should be kept open and maintained during the hunting season to promote increased deer harvest (see 43.1).

(2) **Silvicultural Modifications.** Leave logged areas unburned to restrict deer access to trees and to preserve existing food. Plant as late in the spring as is consistent with other reforestation requirements when planting on deer winter range. Mix tree species and include those of low preference. Plant stock 24 to 30 (61-76 cm) inches in height with leader diameters of 3/8 inch (1 cm) or larger. Practice obstruction planting. Plant a minimum of 8 feet (2.4 m) from well used deer trails. Plant on the uphill side of logs, stumps, rocks, and other obstructions when on steep hillsides (see 45.5).

(3) **Habitat Manipulation.** Consider possibilities for reducing browsing pressure on conifers by improving quantity and quality of food in areas away from damage-susceptible plantations (see 45.2).

(4) **Area Production.** Game-proof fencing is an effective method of controlling deer use in plantations. However, it restricts other uses on the area and it should be used only after other protection alternatives have been evaluated and judged inappropriate. Nylon fencing appears to be least expensive and most adapted to conditions in western Oregon and Washington (see 46.11).

d. **Plastic Tubing.** Tubing or using bud caps on individual trees is an effective method for protecting trees from deer damage. Tubes should not be used on steep slopes where deep snow cover normally occurs (see 46.31 and 46.34).

e. **Repellents.** BGR can be used to provide short-term protection (see 42.1).

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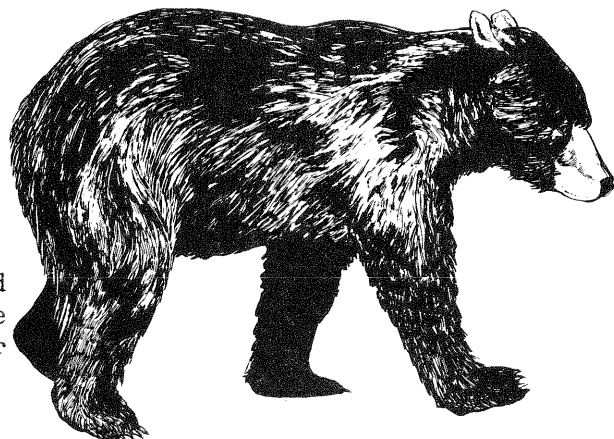
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51.2 - Carnivores51.21 - Black Bears
(Ursus Americanus)

1. **Description.** The most common and widely distributed of the bears, the black bear may weigh 200-500 pounds (90-227 kg) and reach a height of 2-3 feet (0.6-0.9 m) at the shoulders. Its color varies from cinnamon or black to a light brown, and there is usually a small patch of white on the breast.



2. **Economic Significance.** Black bears are treated as game animals in Region 6.

Bears occasionally catch and kill game animals or cattle, but receive their greatest notoriety as sheep-predators.

Most black bears are shot incidentally by people hunting deer and elk. There is also considerable sport-hunting with hounds in local areas where bears are abundant.

Bear pelts are only of minor importance in the American fur market. The largest outlet is in England where the furs are used in making hats.

Bear damage is localized in Region 6, however, this damage is expected to increase as more plantations reach pole size.

3. Life History Information

a. **Preferred Habitat.** Black bears inhabit the forested regions of Oregon and Washington. Dense forests with scattered mountain meadows and areas of berry-producing shrubs provide ideal habitat. Bears seldom venture very far from escape cover.

b. **Feeding Habits.** Succulent herbs, roots, grasses, nuts, fruits, insects, and animal flesh are readily eaten. However, vegetable matter makes up the bulk of the diet. In many areas, bears do considerable damage to young conifers during May, June, and July, by stripping off bark to feed on the inner (13-38 cm) tissue. They prefer fast-growing, smooth-barked trees from 5 to 15 inches DBH. They bite the bark off or peel it downward and then scrape the sapwood with upward movements of their lower incisors.

c. **Activity.** In western Washington, the home range of female black bears is about 1 square mile (2.6 km²), and of males about 30 square miles (48,000 ha) (Poelker and Hartwell 1973).

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d. **Reproduction.** Black bears are polygamous. Most breeding takes place during June and July, and females are usually bred every other year. Breeding begins when the animals are 3-1/2 years old. The gestation period is from 7 to 7-1/2 months. Cubs are born in January or February while the mother is still in the den. Twins are normal, singles and triplets are not uncommon. The average annual population increase is about 5 to 12 percent.

4. **Damage Problems and Their Control.**

a. **Identification.** Black bears leave large strips of bark around the bases of trees they peel. Long vertical grooves in the sapwood are left by the incisors as the bear strips off the outer layers of sapwood, in contrast to rodents that leave short horizontal or diagonal grooves in barked stems.

(Continued on next printed page.)

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Figure 50.1. Basal barking on Douglas-fir by black bear. Long vertical grooves on exposed sapwood and large strips of bark at base of tree are identifying characteristics.

b. **Determining Need for Damage Control.** Before undertaking a general bear-reduction program, stand exam information needs to be reviewed closely to determine if the impacted stands are being reduced below acceptable stocking levels, or are merely being thinned. Frequently, individual bears can be removed to alleviate a serious problem.

c. **Control Methods.** Hunting and snaring are the only control methods applicable at the present time. The actual effectiveness of these methods in reducing damage to young trees is not fully known, but population reduction usually will reduce damage to an acceptable level. There is no current data to support supplemental feeding as a method for reducing bear damage to trees; it is not recommended by USDA-APHIS, and it may result in serious long-term bear problems.

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* (1) **Hunting.** Sport hunting for bears should be encouraged because it is a desirable resource use. Black bears are game animals in Oregon and Washington, with seasons established and hunting licenses required. In Washington, spring bear hunts may be established in known problem areas to remove damaging bears. Consult the current big-game synopsis for specific information. Where allowed, hunting with dogs usually increases the chance of success. People should be encouraged to hunt in areas where tree damage is occurring. Local newspaper and radio releases can be helpful in directing hunters to critical areas. Maps showing damage areas and the road system should be given to inquiring hunters.

(2) **Snaring.** Taking bears with a steel-cable-foot-snare is a common practice in many damage areas. Snaring has the advantage of restricting control to problem areas and increases the likelihood of taking the animals that are causing the damage to trees. In both Oregon and Washington, a permit must be obtained from the appropriate Game or Wildlife Department before undertaking a bear reduction program involving foot snares.

(3) **Piling slash against bases of crop trees at precommercial thinning.** First trials are inconclusive; practice is labor-intensive.

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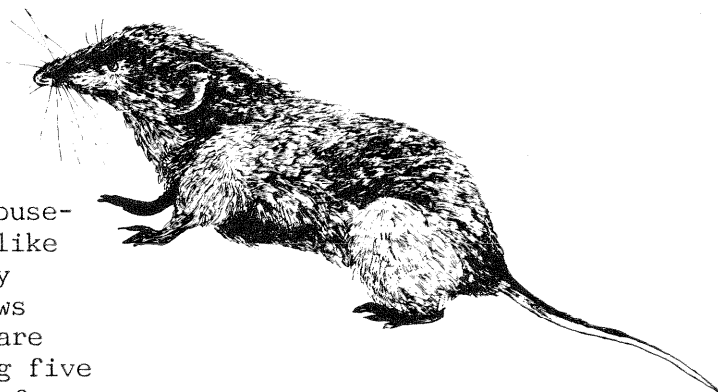
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52 - NON-GAME ANIMALS52.1 - Insectivores52.11 - Shrews (Sorex spp.)

1. **Description.** Shrews are mouse-sized insectivores with dark bead-like eyes. Ears are concealed or nearly concealed by soft thick fur. Shrews differ from mice, with which they are often times confused, by possessing five toes on each foot. Mice have only four toes on each front foot. Field identification among species is difficult.

2. **Economic Significance.** Shrews are among the many small forest mammals that eat conifer tree seeds. The extent of their seed depredations has not been determined but studies by Kangur (1954) indicate that they may eat significant quantities.

3. **Life History Information**

a. **Preferred Habitat.** Several species of shrews occur throughout Region 6, but they are most abundant in mesic-forested regions. Most shrews prefer moist sites with an abundant food source and dense cover.

b. **Feeding Habits.** Shrews feed primarily on adult and larva of insects, other small forms of animal life, and carrion when available. Shrews also eat tree seeds. They have both a voracious appetite and a rapid rate of digestion, and will starve to death if deprived of food for even a few hours.

c. **Activity.** Shrews are active throughout the year. They spend most of their time under cover and may be active either day or night.

d. **Reproduction.** Shrews do not breed until their second year. They usually have two litters of four or five young per year.

4. **Damage Problems and Their Control**

a. **Identification.** Damage by shrews has not been studied extensively. A trapline survey is the best way of determining shrew occurrence.

b. **Determining Need for Damage Control.** Shrews should be considered as potential seed eaters, and included with the small rodents when considering need to protect seed.

c. **Control Methods.** None known.

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52.12 - Moles (Scapanus spp.)

1. **Description.** Moles live most of their lives beneath the surface of the ground. Their small, pinhead-size eyes are adapted to poor light. Broad front feet, with palms usually facing outward, aid the mole in burrowing through the soil. Ear openings are completely covered by thick, soft fur.



2. **Economic Significance.** Moles are generally more of a nuisance than an economic liability. The most serious problems occur in yards and garden areas, where they do extensive burrowing and mound building in searching for earthworms and grubs.

3. Life History

a. **Preferred Habitat.** Moist soils, lawns, fields, and forest areas where soil can be easily worked.

b. **Feeding Habits.** The major item in the diet of moles is earthworms. Shrubs, sowbugs, and insects are also consumed. Small amounts of vegetable are occasionally consumed.

c. **Activity.** Moles are active day and night, all year. Peak periods of mound building occur in late winter and early spring, and also in the fall as young disperse and establish new burrow systems.

d. **Reproduction.** Breeding occurs in February-March, with young born in March-April. One litter is raised yearly with two to six young per litter.

4. Damage Problems and Their Control

a. **Identification.** The mounds and shallow tunnels of moles are readily noticeable whenever they are present. The mole creates a rounded soil mound-hill by shoving excavated dirt up through the center of the mound. See Section 22.21 for the key features that differentiate mole hills and gopher mounds.

b. **Determining Need for Control.** Control of problem individuals is the best approach. Preventive control is not generally recommended as it can be time-consuming and expensive, while individuals can be readily removed.

c. Control Methods

(1) **Baiting.** No pesticides are registered for use in the control of moles on National Forest lands.

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(2) **Trapping.** Trapping is the most reliable method of control. Several different mole traps are available at local hardware stores and nurseries. Most mole traps are designed to be activated by a mole pushing aside an obstruction in a main runway of its burrow system. Trap sites should be selected by locating areas of recent activity, then stamping down short sections of the runway to determine if it is still being actively used. Main tunnels probably will be repaired within a day. The shallow feeding tunnels frequently are not reused and should not be used for trap locations. Best results are obtained by setting traps only in actively used main tunnels (see Figure 50.2).

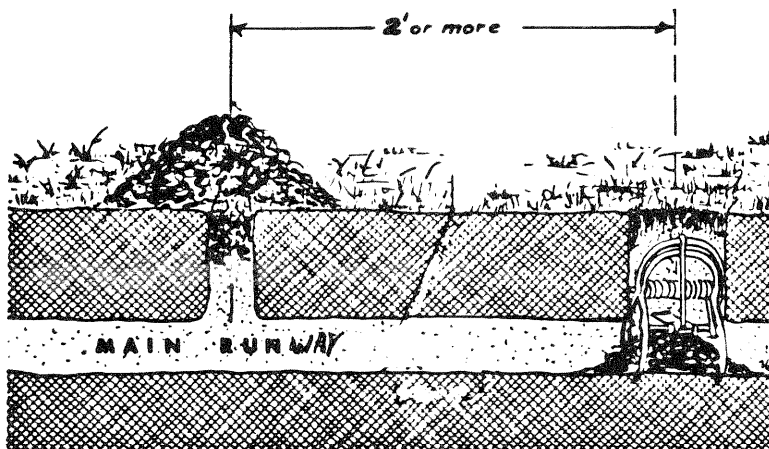


Figure 50.2. Scissors-jaw trap set in main runway, showing the position of jaws, and the dirt plug under the trigger.

(3) **Indirect Control.** Insecticides have been used to eliminate all insects and earthworms from problem areas. Moles will avoid treated areas, moving to other areas where an adequate food supply exists.

(4) **Fumigants.** There are several fumigants registered for use in controlling moles. The variability of soil moisture, tunnel depth, and burrow length all combine to make the use of fumigants questionable.

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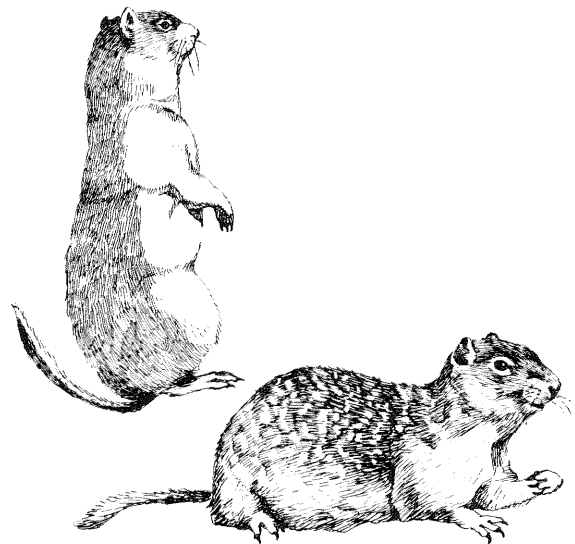
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52.2 - Rodents52.21 - Ground Squirrels52.21a Belding (Oregon) Ground Squirrels (*Spermophilus belding*) and Columbian Ground Squirrels (*Spermophilus columbianus*)

1. Description. The Belding ground squirrels are medium-sized, with grayish upper parts mixed with buffy white. Usually a brownish streak runs down its back. The tail is reddish beneath, tipped with black and bordered with buff or white.



The larger Columbian ground squirrel may be distinguished from all other species within its home range by its mottled, gray upperparts and dark rufous feet and legs. It has a full, bushy tail.

2. Economic Significance. Baily (1936) estimated that maximum densities of Belding ground squirrels in fertile valleys of eastern Oregon went as high as 100 per acre (245 per ha). Populations of this density are capable of eating and/or destroying large amounts of feed that ordinarily would be available for livestock and big game. In years of low forage production, squirrel competition can influence big-game survival on winter ranges.

Belding and Columbian ground squirrels are usually of only minor concern in reforestation programs, but they do feed on emerging pine seedlings and young trees when other food becomes scarce.

3. Life History Information

a. Preferred Habitat. Belding ground squirrels range east of the Cascade Mountains in Oregon. Columbian ground squirrels are found in eastern Washington and northeastern Oregon. Meadows, grasslands, and openings in or along the edges of ponderosa pine, Douglas-fir, and larch stands are the most suitable habitat.

b. Feeding Habits. Spring and early summer foods consist mainly of roots, and green vegetation, including grasses, legumes, and a wide variety of succulent plants. Some insects are also taken. In late summer, ripening seeds and grains are taken in abundance. Food is not stored.

c. Activity. These ground squirrels normally enter hibernation in the fall as soon as they have accumulated sufficient body fat. Older males enter hibernation between late July and early August. Young animals require much of their food for growth and some may be found above ground as late as mid-September. Emergence takes place in February and March, after from 5 to 7 months of hibernation.

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Ground squirrels are short-ranging animals, and may spend their entire life in a very small area.

d. **Reproduction.** Breeding takes place shortly after spring emergence. Young are born in 24-30 days and leave the nest in 2 to 3 weeks. Litter sizes average from five to seven.

4. Damage Problems and Their Control

a. **Identification.** These ground squirrels are active during daylight hours. Their burrow entrances and adjacent soil mounds are readily apparent.

b. **Determining Need for Damage Control.** Squirrel control may be needed to protect new grass seedlings if old meadow area is heavily populated. Ground squirrels are seldom a problem on forest land, unless it has been deforested for several years.

c. Control Methods

(1) **Baiting.** Use 0.5 percent strychnine-treated oats for Columbian or Belding ground squirrels (see 41.21).

The most effective and economical control work can be done about 6 weeks after the first squirrels are seen in the spring. At that time, the young as well as the adults are out of the den. Squirrels do not accept grain baits as readily in this season as they do later when natural grains are beginning to ripen.

Bait should be scattered in teaspoonful amounts in runways and on hard-packed earth mounds in front of burrow entrances. Bait should not be thrown into the burrows as ground squirrels will merely push it out or bury it. It should never be placed in piles because this jeopardizes other wildlife.

(2) **Habitat Manipulation.** There is a direct relation between squirrel numbers and range condition. Poorer vegetation conditions usually provide more desirable squirrel habitat because of decreased plant density and the greater variety of forbs (weeds) species.

Improving poor range conditions through management will often reduce destructive concentrations of ground squirrels.

(3) **Trapping.** Use No. 0 jump traps (see 44.1). Trapping individuals is effective and highly selective. Trapping should be used only for localized problems, as it is time consuming and costly.

(4) **Hunting.** A .22 caliber rifle is suitable for shooting squirrels.

(5) **Fumigants.** Fumigants give uncertain results, but at times are effective at reducing squirrel populations (see 41.24).

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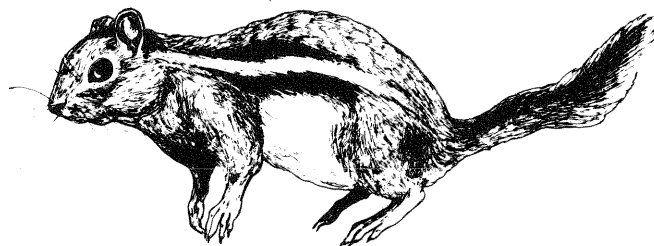
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52.21b - Golden-Mantled Ground
Squirrels (*Spermophilus*
lateralis)

1. **Description.** This chipmunk-like ground squirrel has a relatively short, straight tail. The head is a copper color, and there are white stripes bordered with black on each side of its back. There are no stripes on the sides of the face, which distinguish it from chipmunks.



2. **Economic Significance.** Golden-mantled ground squirrels consume large quantities of both coniferous seed and emerging seedlings. They are the most destructive of the ground squirrels to forest regeneration in Region 6.

These chipmunk-like squirrels adapt easily to human presence and become quite tame. They provide much entertainment to forest, park, and campground visitors because of their willingness to accept food from hand. Their appearance and mannerisms also make them a very attractive part of the natural environment.

3. **Life History Information**

a. **Preferred Habitat.** Forest lands, containing rocky areas for nesting, provide ideal habitat. Distribution occurs throughout eastern Oregon, southeastern Washington, and the Cascade and Siskiyou Mountains of southern Oregon.

b. **Feeding Habits.** The golden-mantled ground squirrel is quite versatile, eating green vegetation, roots, bulbs, seeds, grain, nuts, berries, mushrooms, and meat. Diets vary with seasonal availability of different plants and plant parts. Carrion meat is apparently eaten whenever available.

c. **Activity.** Golden-mantled ground squirrels are active during daylight hours. They rarely climb trees. Nesting is in underground burrows, which are usually in rocky areas. Hibernation starts about the middle of September and usually lasts until May. Variations in the hibernating period are caused by location, elevation, weather, age, sex, and physical condition.

d. **Reproduction.** Breeding occurs once a year shortly after emergence from hibernation. Four to six young are born in late June or early July.

4. **Damage Problems and Their Control**

a. **Identification.** The golden-mantled ground squirrel often opens ponderosa pine seeds on a rock or log used as an exposed feeding perch, leaving the empty hulls nearly intact. Clipping of needles and newly-emerged seedlings also occurs, but it is difficult to identify.

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Figure 50.3. Ponderosa pine seeds opened by golden-mantled ground squirrels.



b. **Determining Need for Damage Control.** The golden-mantled ground squirrel should be considered a potential seed-eater, if broadcast seeding is planted. Clipping damage is erratic, but if found to be a persistent problem in an area, a temporary reduction of squirrels should be considered.

c. **Control Methods**

Baiting. Use 0.5 percent strychnine-treated oats (see 41.21). Place treated oats along squirrel runways or around burrow entrances. Bait should be distributed in teaspoonful amounts and should be scattered over several square feet to prevent livestock or big game from consuming lethal quantities.

Golden-mantled ground squirrels do not readily take grain baits in the spring. They must be controlled in the summer or early fall before hibernation.

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52.22 - Chipmunks (Eutamias sp.)

1. **Description.** The chipmunk is probably the most popular and well known squirrel species. They can be easily identified by facial stripes which distinguish it from all other mammals over most of its range. Side and back stripes end at its reddish-colored rump.

2. **Economic Significance.** Coniferous tree seeds are one of the favorite foods of chipmunks. These seeds are eagerly sought after and stored for winter use. Studies have shown that chipmunks can consume more than 200 ponderosa pine seeds in one day's feeding. When these animals are abundant, they have a deleterious effect on both natural and artificial seeding. Most seed stored by chipmunks is in deep caches and even if uneaten, few seeds will grow.



Chipmunks are a major food of many predators.

3. **Life History Information**

a. **Preferred Habitat.** Chipmunks occupy nearly all forest and range lands.

b. **Feeding Habits.** Principal foods are flowering plant and tree seeds, grasses, berries, roots, and insects. Large quantities of seeds are stored in deep underground burrows to provide food during the winter.

c. **Activity.** Chipmunks are terrestrial, but climb readily when attacked or when searching for food. Activities are confined to daylight hours. Nests are usually underground, near the base of a stump or beside a rock or log. Animals are most active during the spring, summer, and fall. They hibernate in winter, but wake occasionally to eat from stored food and make short excursions from their dens.

d. **Reproduction.** Breeding occurs once a year, usually in March or April. The gestation period is 28-30 days and litters average four to six.

4. **Damage Problems and Their Control**

a. **Identification.** Trapline surveys and general observations give a good indication of chipmunk occurrence (Figure 50.4).

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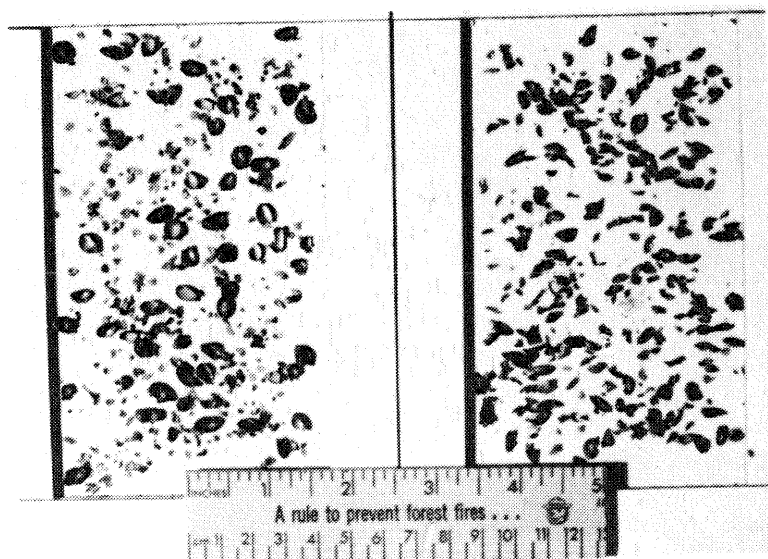


Figure 50.4. Seed-coat fragments after feeding by chipmunks; ponderosa pine on left, and Douglas-fir seed on right.

b. **Determining Need for Damage Control.** Chipmunks should be considered with deer mice, when determining rodent control or repellency needs for seed protection. Clipping of emergent seedlings occurs, but has not been shown to be a serious problem.

c. **Control Methods.** Control may be needed when populations are high in reforestation project areas scheduled to be seeded. Control is most effective in spring and early fall. Spring control protects emerging seedlings. Early fall control helps protect the seed during the period in which it is normally collected and stored by chipmunks.

Baiting. Use 1-16 strychnine-treated oats (see 41.21). Place teaspoonful amounts under logs, in slash, under upturned stumps, or in other protected spots. Do not bait during the winter, because chipmunks are not active enough to be effectively controlled.

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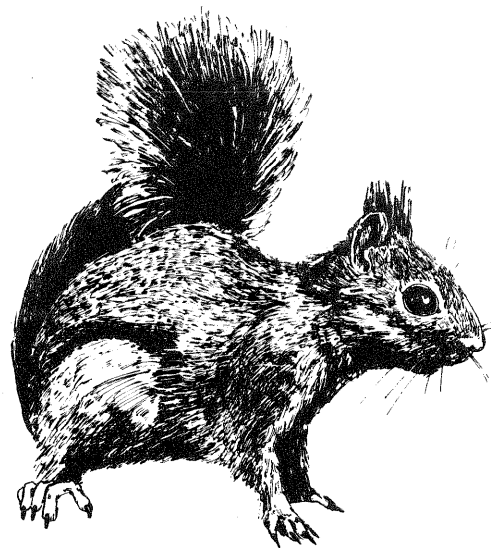
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52.23 - Tree Squirrels,
Douglas Squirrel or Chickaree
(Tamiasciurus douglasii) and
Red Squirrel (Tamiasciurus
hudsonicus)

1. **Description.** The vocal Douglas squirrel is a dark, reddish-olive color, with a yellowish or rusty belly. Distinct black lines along each side, which develop during the summer, help distinguish it from the western gray squirrel.

The bushy-tailed red squirrel is widespread through most of the pine, spruce, and mixed hardwood forests of North America. It is usually heard before it is seen because of its noisy ratchet-like call. Its color is uniformly yellowish or reddish with seasonal variations, including a paler back color during winter and a black line running down each side in summer. It is the smallest true squirrel in its range; head and body length is 7-8 inches (18-20 cm).



2. **Economic Significance.** Red squirrels normally are not a problem on forest lands, but they may be serious nuisances in seed orchards, seed production areas, cone storage facilities, trees with artificially pollinated cones, or conifer stands that are designated for cone collection, because tree squirrels cut immature cones. However, cone cutting and caching also provides a source of seed that may be readily collected.

3. **Life History Information**

a. **Preferred Habitat.** Tree squirrels occupy all coniferous forest types throughout their range in Region 6. The Douglas squirrel inhabits the coniferous forests of the Cascades and western slopes in Oregon and Washington. Red squirrels inhabit the coniferous forests of eastern Washington and northeastern Oregon.

b. **Feeding Habits.** Seeds, berries, nuts, buds, mushrooms, and insects are eaten when available. Large quantities of food are stored, and single caches may contain from eight to ten bushels of cones. When feeding on cones, they habitually return to a favorite log or low limb, eventually creating a large "midden" pile of discarded cone scales.

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c. **Activity.** Red squirrels are diurnal (active during daylight hours). They are agile climbers, but also spend much time on the ground. Nests are usually in hollow trees, logs, or old woodpecker holes. One squirrel may have several nests. Home range is normally from 1/2 to 1 acre (0.2-0.4 ha). Red squirrels do not hibernate, but are inactive during cold or wet weather.

d. **Reproduction.** One litter per year is normal in the Rocky Mountain States, although two litters may occur. Females breed during their second year, in March and April. The gestation period is about 40 days, and litters vary from three to six. The young are weaned in about 5 weeks.

4. Damage Problems and Their Control

a. **Identification.** The occurrence of scattered cut cones and an accumulation of cone scales in a midden pile indicate the occurrence of these tree squirrels, if their chattering has not already caught your attention. The tips of branches are often cut and peeled during the winter (see Figure 50.5). Sometimes only the buds are eaten from the twigs.



Figure 50.5. Field sign of tree squirrels showing: A-opened Douglas-fir cone, with scales cut and removed. B-branch tips of pine cut and peeled during the winter.

b. **Determining Need for Damage Control.** Control is needed only on an individual basis to protect seed trees, or occasionally to keep squirrels out of buildings.

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c. Control Methods. When local problems arise, the following protective measures should be used:

(1) Individual Tree Protection. Bands of sheet metal flashing will prevent squirrels from climbing trees. The bands should be at least 2-feet wide and should be placed 6 feet above the ground. Branches of protected trees should not be adjacent to unprotected trees.

(2) Trapping. Individual squirrels can be readily trapped with a live trap, size 0 jump trap, or a coinbear size 101 trap using walnut meats for bait.

(3) Baiting. No poisonous baits are registered for use to control tree squirrels in Region 6.

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52.24 - Pocket Gophers (*Thomomys* sp.)

1. Life History. The evaluation of pocket gopher damage must begin with a knowledge of the animal: How to identify it, its characteristics and behaviors, and how its populations increase and decrease.

a. Species Description

(1) Physical characteristics. Although there are three genera of pocket gophers in the United States, the most common in the National Forests of the Northwest is the northern pocket gopher (*Thomomys talpoides*). The most distinguishing characteristics of all pocket gophers are the external cheek pouches which open on either side of the mouth and lips that close behind large yellow incisor teeth. Consistent with a burrowing mode of life, they have long, curved front claws. Size is extremely variable in pocket gophers and ranges between a head and body length of from 5-9 inches (13-22 cm). The size of pocket gophers seems related to the vegetative community, locality, altitude, and latitude of their habitat and males are generally heavier than females.

At the present time, only two age class distinctions can be made in the field: juveniles (less than 1 year old) and adults (1 or more years old). Juveniles are noticeably smaller in size and have smaller reproductive organs.

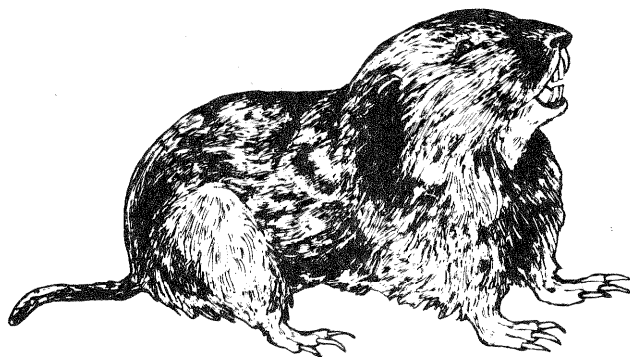
(2) Similar Species. Ground squirrels are sometimes called "gophers" in local expression, but pocket gophers are most often confused with moles. The following comparison lists the differences distinguishing pocket gophers from moles.

Pocket Gophers

Large yellow incisors.
Blunt snout, small eyes
and ears.
Cylindrical winter "casts",
above ground.
Fan-shaped mounds with earthen
"plug" in side entrance.

Moles

No incisors.
Long snout, no apparent eyes
or ears.
Tunnels form low surface
ridges.
Circular mounds with center
entrance unplugged.



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b. **Pocket Gopher Reproduction.** Usually, only one litter is produced per year. Breeding occurs in early spring. After a gestation period of about 18 days, a litter of four to eight young are born in the burrow system of the female and reared by her for about 40 days. The juveniles then disperse and establish their own burrow systems. Burrowing through snow facilitates pocket gopher dispersal.

c. **Population Cycles.** Pocket gopher populations are dynamic and exhibit random fluctuations. Gopher numbers continue to increase until an imbalance occurs between the population level and how its needs can be met in its environment. During the annual cycle, pocket gopher populations generally peak at a high level between August and October and then begin to decline until spring when the population increases as young are produced. The population is comprised of up to 75 percent juveniles. The range of fluctuation that populations can undergo can be dramatic. Densities have been recorded as low as three per acre to as high as 40 per acre.

Natural limiting factors which regulate pocket gopher populations include: predation, weather, food and cover, and to some extent gopher territoriality.

The major predators of gophers include weasels (Mustela sp.), coyotes (Canis latrans), bobcats (Lynx rufus), badgers (Taxidea taxus), great horned owls (Bubo virginianus), great grey owls (Strix robulosa), barn owls (Tyto alba), hawks (Buteo sp.), and snakes. Dispersing juveniles have the greatest vulnerability to predators as they travel above ground at times. However, predation acts more to slow the rate of increase than to prevent the population from peaking.

The greatest influence of weather on gopher populations occurs in the winter and relates to the amount of snowfall received. An extremely deep snowpack with a high water content results in high mortality of both adults and the newborn young when the excessive melt-off saturates the ground with water and floods burrows. Too little snowfall results in even higher gopher mortality, since most forest and range soils percolate ground water rapidly and the soil freezes solid without the insulating effects of deep snow. Pocket gophers may freeze to death in their burrows under these conditions.

Gophers are herbivorous and highly adaptable in their feeding habits. Food and cover are the most important limiting factors on gopher populations and appear to have the greatest effect on gopher numbers. The relative abundance and quality of forage and the amount and type of habitat available directly correlates to the density of pocket gophers in a particular area. Territories of individual gophers are smaller or larger depending on habitat conditions, and since these territories are aggressively protected, only a certain density within a population will be allowed.

The maximum life span of pocket gophers is 5 years. However, few gophers live beyond 2 years. Juveniles (less than 1 year old) have the highest mortality rate in pocket gopher populations, and winter mortality of all age groups takes the greatest toll.

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2. **Habitat Characteristics.** Unless the land manager has an understanding of pocket gopher habitat requirements, effective control solutions cannot be achieved.

a. **Plant Community Types.** Pocket gophers are remarkably adaptable and occupy a wide range of plant communities from sea level to over 10,000 feet in elevation. However, the communities most preferred by gophers are those supporting an understory of relatively lush stands of fleshy, rooted forbs and/or rhizomatous sedges, and, to a lesser degree, grasses. Rangelands, meadows, clearcut areas, burn areas, and open conifer forests are the most desirable sites if adequate soil depth for burrowing is present. Some of the factors enhancing the selection of a site by pocket gophers are: (1) the palatability of the vegetation, (2) the associated plant species or the combination of plant species occurring in an area, (3) the climate and topography of the area, and (4) the seral stage of the plant community (for example, whether brush invasion is changing the grass/forb composition).

b. **Soil Conditions.** Because pocket gophers live underground in burrows, soil characteristics also help determine pocket gopher habitat preference. Gopher burrow systems usually are located in friable, light-textured soils with good drainage, poor water-holding capacity, and high porosity. Clay soils, soils with a depth of less than 6 inches, soils with a shallow water table, and soils that are continuously wet are unfavorable for pocket gopher burrowing. Pocket gophers tend to utilize soils with a moisture range up to 50 percent.

Pocket gopher burrow systems provide shelter and access to forage. Each adult has its own burrow system that covers an area of about .02 to .1 acre. The systems consist of runways 4 to 48 inches below the ground surface. Side tunnels from the main runways are used as exits and for deposition of soil, debris, excess food, and feces. Larger chambers are used for nest sites and food storage. Tunnels are from 2 to 3 inches in diameter. Feeding tunnels are shallow, normally 2 to 8 inches below the surface, and are most extensive in areas where vegetation is sparse.

Food caches are maintained near nest chambers and shallow underground food caches are also located 3 to 4 inches below the ground in lateral chambers loosely plugged off from the main burrow system. Large amounts of plant materials may be stored.

The burrow system is a closely regulated micro-environment, and a gopher will generally plug any openings in the system within 48 hours--often within 24 hours.

By building, maintaining, and living in burrow systems, pocket gophers leave three types of physical signs on the surface of the ground that are visible in the snow-free period. These are mounds, winter soil casts, and earth plugs.

The typical horseshoe-shaped mounds pushed up by gophers are the result of soil excavated as they extend and repair their burrow systems. Mound-building is most common in late summer and fall when juveniles are establishing burrow complexes and older animals are enlarging systems.

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In winter, gophers extend their systems into the snow, apparently to facilitate their search for food. Later, excess soil is pushed into these snow burrows to create the ribbonlike "winter casts" that become evident as the snow melts. These winter casts can indicate where damage might occur if conducive conditions are present.

Earth plugs are more difficult to detect. They are small circles of disturbed soil at the ground surface or a small circular depression toward the edge of a mound. These usually are formed where gophers have emerged to forage and plugged the hole upon reentry. In spring, earth plugs and winter casts may be the only soil indicators of current pocket gopher activity.

c. **Food Habits.** Pocket gophers are herbivorous mammals and utilize all portions of plants in their diet. Roots, stems, leaves, and bark (girdled from woody species) provide forage for gophers. Because of their burrowing habits, roots are readily available but pocket gophers also make openings from their tunnels and forage for food and nest material above ground. In some cases, they have been observed pulling entire plants down through the soil into their burrows. Barking and clipping of shrubs and trees occurs above ground, especially under snow in winter.

Forbs are the most preferred food plants of pocket gophers. Grasses are also utilized, but never as a major component of the gopher's diet. The cambium layer and roots of woody species tend to be utilized by gophers in winter when other fresh vegetation is scarce and in summer and fall when other vegetation is drying up and roots are being collected for food caches.

The habit of storing food in underground caches may account for the harvest of considerably more vegetation than is actually eaten. Roots constitute the major portion of the forage collected for food caches.

3. Gopher Damage Identification and Analysis

a. **Reforestation.** Pocket gopher damage to forest crops was reported as early as 1940, but there were few reports until recent years, when damage by pocket gophers became a reforestation problem. This increased importance is the result of intensified management and recognition that gophers are responsible for some damage previously attributed to porcupines (Erethizon dorsatum), mice, squirrels, livestock, and unknown causes.

Increases in pocket gopher problems and subsequent damage are directly related to opening up timber stands through harvest, insect and disease losses, or wildfires that result in a flush of seral vegetation (forbs and grasses). Normally, the gophers are widely distributed in timber stands, but primarily concentrated in sites such as river banks, spring areas, meadows, and other breaks in the forest canopy where preferred ground vegetation provides ample forage. Dense brush areas often produce low food volumes, limiting gophers on these sites.

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- ★ Substantial gopher populations can become established in 2 to 3 years, when a low residual population is present on or near an area. The current reforestation policy is to plant or seed as soon as possible after harvest treatment. This allows tree seedlings to develop into larger less-susceptible sizes as the gopher population is expanding. Slow growing conifers in rapidly expanding gopher population areas are subject to greater damage and mortality in the first 3 to 5 years due to a low live-meristematic tissue area. A second advantage of rapid reforestation is the lack of competition for available soil moisture by the seedling, often resulting in higher seedling survival rates.

Heavy pocket gopher infestations in regeneration areas have commonly resulted in seedling losses of 20-30 percent and occasionally up to 70 percent in one year. Pocket gopher damage losses of seedlings in regeneration areas usually continue over a period of years so that what can appear as acceptable yearly gopher-caused seedling mortality is actually, in a cumulative respect, excessive.

The two most common forms of tree damage by gophers are root pruning and a combination of stem girdling and clipping. Stems of small seedlings (basal diameters of 1/2 inch or less) are cut into two or more sections. Seedlings are frequently clipped at or near ground level and the roots or the stems are taken. Gophers may pull entire seedlings into their burrow system leaving no evidence of damage, since the trees are missing. Root pruning and girdling of small seedlings occurs year-round but is most frequent in winter.

Root pruning on larger seedlings and saplings also occurs year-round. The seasonal frequency has not been determined, primarily because damage generally does not become evident until long after the trees have been injured. Some trees also incur damage over a period of several years. Characteristic indicators of root-pruned trees include shortened needles, premature needle drop, shortened internodes, and/or overall poor development.

Clipping and girdling on larger trees occurs primarily under snow cover. This damage is more prevalent in areas where heavy snowpacks persist or food quantity is short. Girdling is often complete, leaving white stalks that are easily seen in spring.

Other types of tree damage caused by gophers include root exposure by burrowing and burying of seedlings by winter casts or mounds. Root exposure occurs most often in conjunction with root gnawing and girdling. It is usually of minor importance in comparison to other types of damage. Damage from winter casts or mounds deposited on small planted seedlings or naturals is a common occurrence in areas of high gopher density. This burying of seedlings under winter casts or mounds often results in permanently deformed boles of trees which limits their future harvest value.

b. Range Condition. Damage by pocket gophers to rangelands varies with livestock use and condition of the range. In past years, much time, effort, and money was spent for pocket gopher control on poor condition rangelands. Because of changes in management and better condition of the range, pocket gopher control is not considered necessary and/or economically feasible at this time.

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c. **Soil Erosion.** Pocket gopher activity can accelerate soil erosion in some areas depending on slope, the properties of the soil type, and the action of water. Tunnels collapsing and water running through borrows may intensify already existing erosion potentials. However, significant problems have not been identified in the Region that would warrant control measures.

d. **Dams and Dikes.** Pocket gopher activity can have an effect on these improvements by weakening their structural design and/or by decreasing their water-holding capacity.

e. **Damage Surveys.** There are three methods of surveying pocket gopher density. The purpose of the survey determines which of the three methods are used. The first method, the reconnaissance survey, simply evaluates the absence or presence and relative numbers of pocket gophers. This method is used to determine the extent of pocket gopher damage potential and usually is initiated when a timber management proposal entails some form of regeneration harvesting as an alternative. The second type, the gopher-mound survey, determines the population level present in an area. Its purpose is usually to determine the location and extent of gopher control needs. The last method, the open-burrow survey, evaluates the effectiveness of baiting or trapping as a control technique.

f. **Reconnaissance Survey.** This survey method is usually a part of another examination, such as a timber sale reconnaissance. The primary purpose of the survey is to determine if an active gopher population exists on the area, and, if so, the extent and relative size of the population.

Information is collected at each plot, as the survey is being conducted for other purposes. The presence of recent mounds (mounds formed during the year) and/or winter casts are primary indicators of a population. Of principal concern in this method is determining if a population exists and how much of the area has an active population associated with it.

For example, during a silviculture examination conducted for timber sale purposes, the gopher reconnaissance conducted reveals some gopher activity on 50 percent of the area. If the silviculture prescription developed for that stand area calls for a Regeneration Harvest method, one element of the reforestation portion of the prescription should deal with: (1) the type of regeneration that would occur; (2) the ease with which it is obtained; (3) the amount that could be lost to gophers; and (4) the effect of harvesting on the population of gophers present on the site. These and other determinations, along with the information obtained during the reconnaissance, would allow the discussion of silvicultural alternatives and alert the land manager to assess possible treatment or control alternatives prior to the project's implementation.

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g. Gopher-Mound Survey. An indication of the actual pocket gopher population level and extent of control needs can be obtained with a gopher-mound survey. This survey is particularly useful when control or treatment alternatives are being considered. This survey should be conducted whenever gophers are a potential problem. This survey is often conducted as part of another survey such as reforestation.

The survey determines the percentage of an area that has current gopher activity, by using the presence of recent mounds (mounds formed during the year of survey) to determine the number and extent of the population. The percentage of plots with signs is used as an index to population density and as a basis for determination of control needs.

Standard plot size should be 1/100 acre (0.004 ha) or 11.8-foot radius. Plot sizes can be varied if they are part of another survey being conducted simultaneously.

Minimum sampling intensity should not be less than that of the associated survey or 2 percent of the area. The number of plots and the distribution should be sufficient to determine: (1) the location of population centers, (2) the number per acre, and, (3) the range in numbers over the area.

The results of this survey will provide extent or percent of the area affected, range, and average number of mounds per acre. These data will provide the basis for determining control needs, based on your experience with your local conditions.

The extent of the area affected, as well as the number of mounds, indicates the relative feeding pressure by pocket gophers. While food habits vary by site and availability, the greater the number and extent of gopher activity, the greater is the potential for damage to conifer seedlings.

Whenever pocket gophers occur, some damage and mortality of planted seedlings can be expected. Temporary pocket gopher population reductions in plantations are probably needed if some or all of the following occur:

-- Percentage of active gopher plots exceeds:

<u>New Plantations</u>	<u>Established Plantations</u>
<u>0-2 Years Old</u>	<u>3-5 Years Old</u>
35% of 1/50-acre plots	50% of 1/50-acre plots
25% of 1/100-acre plots	40% of 1/100-acre plots

-- Current stocking level of seedlings is low or marginal and additional environmentally caused mortality can be expected.

-- Trees are growing slowly and are less than 5mm in caliper, 2cm above ground level.

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★_ -- Number of active pocket gopher systems exceeds 2 per acre.

-- Food supply of gophers will be significantly altered by herbicide or other treatment which would cause the animal to seek alternative food sources.

The gopher mound survey and the above criteria should not be relied upon as the sole determination for implementation of a control project. There is also a need to evaluate actual losses occurring on a plantation. The same number of pocket gophers and differing habitats with varying tree sizes, survival rates, and numerous other considerations will result in differing impacts.

It is essential that local experience and conditions be used to make the final determination whether temporary population reductions are needed.

h. **Open-Burrow Survey.** The objective of this survey is to determine the reduction in gopher activity that occurs after operational control programs.

Sampling points are established in an area before treatment. These should be at least 100 feet apart and include recent (less than a week old) gopher activity.

A minimum of 40 sampling plots should be used per treatment area. The plots need to be flagged and numbered to facilitate resurveying. An active burrow system is opened on each plot having recent signs. Twenty-four to 48 hours later, the area is revisited and a notation is made as to whether the opened burrow was plugged or remained open. Repeat the survey from 7 to 14 days after a control treatment. If the direct control operation was successful, there should be significantly fewer plugged burrows found during the second survey.

Biologists believe that, as a minimum, a 70-percent reduction in activity is needed to accomplish a significant reduction in damage. Areas with less than a 70-percent reduction in activity should be considered for retreatment; baiting techniques and other operational conditions should be analyzed to ensure that control activities are optimum.

4. **Damage Control Methods.** At the present time, direct control of damaging gophers, primarily by trapping and poisoning, is the most widely used approach to alleviate pocket gopher damage. In the future, indirect or ecological control involving habitat modification may prove to be a more effective and less costly management approach. This method usually entails changes to make the target area less suitable for gopher occupation.

a. **Indirect Control/Habitat Modification.** Habitat modification is a method in which the environment is altered to make it less suitable for gophers. -x

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- ★- (1) Herbicide Applications. This usually is done by treating an area with selective herbicides to reduce the availability of gopher foods. Vegetation management with herbicides, principally to control perennial grasses and forbs, can result in reduced gopher numbers and may improve conifer survival by decreasing competition from other vegetation for moisture. Herbicide treatment requires a broader area of coverage than site preparation and it is recommended that the planting of conifer seedlings be delayed for one winter period between herbicide treatments and reforestation, which allows time for a sufficient drop in the gopher population. It also prevents the pretreatment gopher population level from being sustained with a primary food source of planted seedlings.

Numerous herbicides are available for use. The selection of an appropriate chemical should be made through consultation with a knowledgeable specialist. The type of herbicide, the timing of application, and the method and rate of application depends on the chemicals considered, their selective toxicity, and label requirements. Identification of the plants or plant types being used as a food source will help indicate the chemical needed. Herbicides need to control the food source and, with the large number of approved chemicals and the continual changes in these chemicals, recommendations should be obtained from specialists (available at either the Forest or Regional Office level).

The response of pocket gophers to herbicide treatments will vary with the type of herbicide application, since the impact of the herbicide on gopher foods depends primarily on the composition and density of the pretreatment vegetation. Because of their highly selective toxicity, some herbicides may cause little resulting mortality, as gophers may switch to slightly less desirable vegetation for food.

Although selective herbicide treatments show a potential to promote the survival and growth of conifer seedlings and make habitats less favorable for pocket gophers, the effectiveness of this method to reduce damage is still unknown. However, on treatment sites the seedlings may be better able to sustain minor damage by gophers. One of the main disadvantages of herbicide treatments involves the possible adverse effects to the food and cover plants of other wildlife species. Abrupt alterations in the vegetative distribution and composition of an area can have a significant impact on certain wildlife populations. In most cases, the impact on other wildlife is temporary since the changes in the vegetation are normally short in duration. Before herbicide treatments are undertaken, an evaluation of the importance of the treatment site to all wildlife should be completed.

In addition to vegetation management, prevention of gopher damage may require direct control or other measures.

(2) Silviculture Modifications. Probably the greatest potential for effective, long-lasting control is through preventive management. In many instances, gopher damage could be avoided or reduced through early recognition of the animal's probable response to habitat changes that result from silvicultural treatments.

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Protecting conifers is difficult on a plantation densely populated with gophers. Recruitment of animals from inside or outside the plantation boundaries will tend to maintain the habitat at or near its carrying capacity. Rather than waiting to confront the problem under these conditions, a logical alternative is to anticipate the potential damage and attempt to prevent the population buildup that causes it.

Some possible alternatives are discussed below:

(3) **Temporary Buffer Strips.** In this method, an uncut strip of timber 500 feet wide is left between logged units and gopher-populated areas. Meadows, open stands, or any area with abundant food supplies adjacent to harvest units should be checked for gopher populations. Buffer strips represent a temporary measure and essentially delay the invasion of gophers into harvested areas and reduce the potential for damage to seedlings. Buffer strips usually just delay the spread of the gopher populations until a later period. This can be acceptable, since in some areas where sufficient regeneration can be obtained, even moderate pocket gopher populations would not pose a problem.

In some situations, buffer strips are most effective when used in combination with the direct control methods of trapping or baiting with chemicals. The need for direct control before harvest is obvious where a reservoir of gophers occurs within a planned logging unit. Direct control in the buffer strips is also necessary if substantial gopher populations are present. Where leaving strips of standing timber is not practical, direct control in stands adjacent to gopher-occupied areas or along plantation boundaries will have a buffer strip effect and should be considered before logging.

(4) **Site Preparation.** Site preparation, in general, is beneficial to tree growth and survival, but the effect of site preparation on seedling survival and growth must be reviewed in relationship to pocket gopher population responses and damage. Site preparation techniques that disturb large amounts of soil should be used as little as possible in areas prone to pocket gopher damage. This practice often results in rapid distribution of pocket gopher populations from adjacent populated areas. Newly disturbed soil often allows the gopher to move rapidly underground. Gophers have been found to utilize roads and terraces and travel up to a mile or more.

Highly disturbed soils created by plowing, discing, or machine planting often predispose seedlings to gopher damage by creating a nearly ready burrow system. Gophers follow these ready-made burrows, gathering food as they go. The continuous site preparation technique can also induce gopher movement along the continuous strips.

Restricted site preparation is a damage control measure which can be used to deter the distribution of gophers. Site preparation with selective herbicides may also be an extremely useful technique (see above).

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(5) **Stage Overstory Removal.** The harvest method selected in a potential pocket gopher damage area can also be a control measure. The relationship of tree crown-cover to herbage production indicates that clearcutting results in the most conducive conditions for pocket gopher invasions and population increases.

By removing only part of the overstory, partial cutting in certain conifer communities minimizes the increase of the understory vegetation due to continual partial shading, retains conifer reproduction in the understory which is usually past the stage most susceptible to pocket gopher damage, and results in minimal soil disturbance. Depending on the habitat type, such an alteration generally supports fewer gophers than a comparable site that has been clearcut. Shelterwood cutting and underplanting shelterwood units, for example, reduced pocket gopher damage to pine plantations in eastern Oregon.

This method and the vegetative communities created must be very carefully analyzed as many timbered habitat types or understory types silviculturally do not readily lend themselves to this treatment. This treatment may not be compatible with species composition requirements.

(6) **Early Planting.** Planting should occur within 1 year following harvest. Waiting a longer period of time to begin reforestation allows an increase in food supplies for gophers, and this often results in higher overall population levels. It normally takes 2 to 3 years after a timber harvest for significant increases in herbaceous vegetation to occur and for pocket gophers to establish a population level detrimental to seedling survival. Planting immediately after harvest will give seedlings a head start.

(7) **Size of Planting Stock.** Larger planting stock is less susceptible to gopher damage than are small-sized seedlings. Seedlings less than 1/2 inch in caliper width are commonly clipped by gophers, especially during the winter as feeding takes place under the snow. Larger diameter seedlings may be chewed, but may not be completely girdled. Also, large caliper stems are seldom bent or pinned down by gopher movement in the snow or the formation of winter casts. Such activity normally leads to misshapen trees.

b. **Direct Control.** Direct control techniques include trapping, tree tubes, and land and machine baiting with chemicals. Choice of these methods should be based on site characteristics, season, available manpower, economic considerations, and local experience.

(1) **Trapping.** Several types of traps are available for controlling pocket gophers, although the Mocabee Kill-trap is probably the most popular. Trapping has been used on forest lands to a limited extent. It is extremely slow and time consuming and is practical only in very small areas, high value situations, or as a supplement to other forms of damage control. Consequently, there appear to be few forest situations where trapping would be feasible. This method is, however, of value as a population determination device.

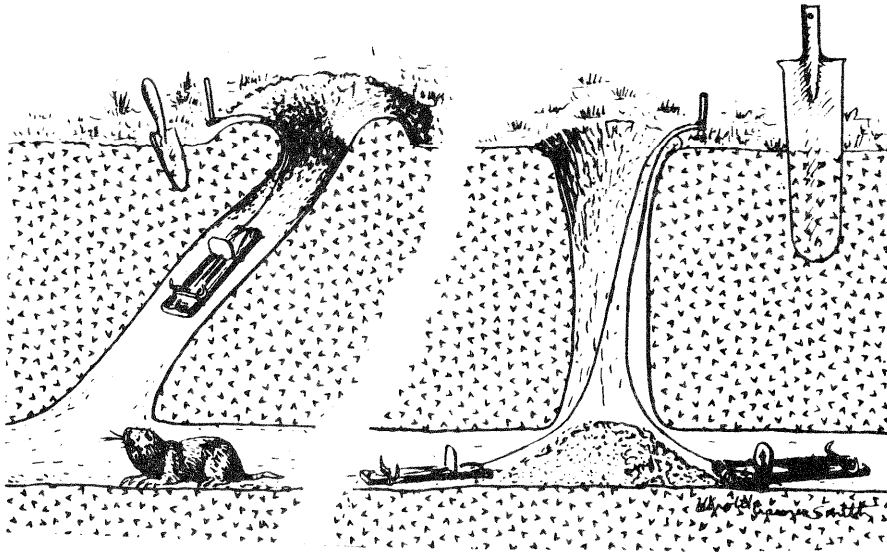
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Trapping procedures:

- (a) Select an area with recent mound-building activity.
- (b) Open the lateral runway with a trowel.
- (c) Set a gopher trap and insert it, with prongs forward, well back into the burrow. If the lateral runway is very short, the main runway often will be exposed during excavation. In that case, a trap should be set in each arm of the main burrow.
- (d) Secure traps with a light chain and pin.
- (e) Leave entrance hole open to attract the gopher.
- (f) Mark each trap spot with flagging so it may be relocated easily.
- (g) When trapping is done in the spring, traps should be reset after a catch is made because a burrow system may have several occupants at that time.

Figure 50.6. Trap Placement for Pocket Gophers.



(2) **Tree Tubes.** The efficiency of tree-tube seedling protectors (trade name Vexar) in deterring gopher damage is good. Seedling protectors have reduced damage by 85-90 percent. In small reforestation areas with heavy pocket gopher damage, seedling protectors can be cost-effective but are very labor intensive. Because of the labor involved, treatment costs for gopher control with this method may increase planting costs by 50 to 150 percent.

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- ★- The seedling protectors cannot be used on slopes greater than 25 percent because snow movement causes terminal bud hangup, distorting the tree. Under the best conditions, terminal bud hangup is a problem on about 25 to 45 percent of the tubes. Data is currently not available on underground breakdown and root escapement after tube planting. Seedling handling, loading, and other technical problems are very common with tree tube protectors.

(3) **Chemical Control with Poisons.** Baiting by hand is a much faster operation than trapping and is safe and effective when done properly. Proper baiting is a difficult job and usually requires one or more annual follow-up treatments. The number of baitings and their frequency will vary from area to area. Initial control success, tree damage, vegetative conditions and potential for reinvasion are among factors to be considered. Baiting should be done during periods of greatest local mound-building activity; using larger baiting crews for shorter periods of time is usually advisable.

The technique requires three steps: (1) location of a runway by probing or excavation; (2) placement of the toxic bait in the burrow by hand, spoon, or other appropriate means; and (3) covering of the exposed burrow.

An improvement over hand-baiting is the mechanical bait dispenser--it is faster and just as efficient. This device allows an operator to locate (probe) a runway and deposit bait in the same operation. With this device, 1 acre per hour can be treated.

Hand-baiting or a bait dispenser may be useful for control on small acreages or with isolated populations or to maintain control and prevent invasion. This method is particularly useful in treating peripheral populations or spot treating populations before they build up.

Control effectiveness of hand or dispenser baiting can be checked readily by an open burrow survey. If the burrow systems are still occupied, they usually will be closed within 48 hours. Activity checks should not be made until bait has been exposed for 2 weeks.

The registered toxicant currently being used is strychnine-treated oats.

c. Procedures for Hand Baiting/Probing/Excavating

Hand Baiting. Any site regularly occupied by pocket gophers may be hand baited, but there are several conditions that influence control effectiveness. The conditions are:

- (1) Active mound building must be taking place to allow best selection of spots to bait. Fresh mounds can be identified by their unweathered appearance and loose horseshoe structure. Recent mounds often will be darker than surrounding soil because of their moisture content.

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(2) Soil moisture and soil type should be such that burrow crumbling is prevented when probing or excavating tunnels for baiting. Moisture content becomes less critical in soils that are well structured, fine textured, or heavily sodded. Granitic soils of the Idaho Batholith and sandy soils are extremely difficult to probe requiring exact moisture conditions during the operation.

(3) Guidance of experienced baiters is necessary to ensure correct bait placement.

(4) The number of available baiters must be sufficient to permit complete coverage of the area requiring protection. This often becomes a problem on large areas.

Probing. This is the most commonly followed method of hand-baiting. It is the fastest hand-baiting technique, but requires considerable knowledge of gopher habits to be done effectively.

Several types of probes are available that can be used to dispense bait through the probe.

Expertness in using the probe is gained largely through experience and self-training. The first step is to select a spot near a fresh gopher mound on which to check for the presence of a burrow. The probe should then be forced gradually into the ground at that location. If the choice is correct, a sudden release of pressure will be felt when the probe enters the burrow.

Initial attempts at probing should be verified by digging out the lateral and part of the main runway. In this way, errors can be quickly corrected.

The following sequence should be followed when baiting with a probe:

-- Select an area with recent mound-building activity.

-- Locate the main runway by probing a lateral runway to its junction with the main runway. Laterals usually will join a main run within 2 feet (0.6m) or less. One or two test probes down each arm of the main runway to form a rough "T" will verify the location of the runway.

Main runways also may be located by the presence of small convex earth plugs. The plugs are made when gophers close their burrows upon returning from surface excursions. A probe can be made directly adjacent to the earth plug, as the main runway is often immediately below.

-- Enlarge a probe hole in the main runway to accept the bait, being careful to avoid making a deep hole in the bottom of the burrow.

-- Drop a teaspoonful of strychnine-treated oats into the burrow. Most baiting operations will require from 1/2 to 1 lb. of strychnine-treated oats per acre (0.6-1.1 kg/ha).

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-- Carefully cover all probe holes with clods, rocks, bark, sticks, or other suitable material, to prevent light from entering the burrow system. Covering the probe holes will reduce chances of nontarget wildlife eating the bait. If the hole is left open, the gopher will often close it, possibly exposing bait to nontarget species by pushing it above ground.

-- Bait two spots in what appears to be the active working area of a single gopher.

-- Mark treated areas with plastic flagging. This will prevent confusion and facilitate inspections.

Excavating. Opening main runways with a garden trowel is a positive method for locating the best baiting spot. The only disadvantage is that it is relatively slow.

Excavating is an excellent way to study the nature and arrangement of the burrow systems of gophers and, in this respect, serves as a useful tool for training inexperienced baiters to use a probe. One or 2 days of burrow excavation before advancing to a probe will help ensure good control results.

The baiting procedure is very similar to the probe technique except the hole is opened to allow bait placements. Follow the steps outlined for hand baiting with a probe.

d. Machine Baiting Procedures. The Forestland Burrow Builder provides an effective means for controlling pocket gophers within limits determined by slope, surface and subsurface obstructions, soil texture, and soil moisture. The soil conditions must be suitable for preparing and maintaining a burrow. Excessively dry or coarse textured soils do not allow this to occur.

The machine is pulled through the soil creating an artificial burrow and at the same time depositing small amounts of strychnine-treated "Rhoplex" oat bait. (The Rhoplex binder added to this bait allows the oats to flow smoothly from the hopper of this machine.) Gophers locate the new burrows and eat the deposited bait within a few days. Maximum control is usually achieved within 7 to 10 days after treatment.

It is estimated that the machine can be used to treat 2.5 to 6 acres per hour. The crew includes a tractor and operator, and bait checker.

An analysis of baiting shows that many benefits have been derived from pocket gopher baiting programs, and the technique is the most common in use today. However, baiting has limitations that should be recognized. First, treatment must be done correctly to assure effectiveness, since mortality of less than 75 percent generally is no greater than would occur naturally. Second, even effective baiting provides only temporary relief. This is an important concept, since tree protection may be necessary for several years, depending on the rate of tree growth. Complete population reductions rarely, if ever, occur and offspring of survivors may quickly repopulate unoccupied systems. In many areas, invasion from uncontrolled populations can also be expected. Not only will an abundance of unoccupied systems likely increase survival of dispersing young, but reduced population densities may temporarily stimulate reproduction.

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Use of the burrow builder on forest lands introduces additional factors not encountered with hand baiting. The artificial burrows may persist a year or more, and the possibility that they expedite reinvasion should not be discounted. One of the most critical factors governing the use of the burrow building is soil moisture. In dry climates, where most gopher reforestation problems occur, use of the machine is restricted to periods in spring and fall. Moisture requirements can usually be met in spring, but reinvasion will necessitate fall treatment in most cases. Fall moisture is unpredictable and at higher elevations may first appear in sufficient quantity as snow. The necessity of last minute scheduling places an added burden on management.

e. Environmental Considerations of Baiting. Strychnine-treated oats are the only approved Federal gopher bait. It is prepared and sold by Pocatello Supply Depot, USDA-APHIS, 238 E. Dillon, Pocatello, ID 83201. Strychnine bait placed underground has a short effective period lasting about 1 week to 1-1/2 months depending on soil moisture and other climatic factors. Strychnine is not bio-cumulative and may be consumed at very low dosages with little or no ill effects over prolonged periods. Extremely high dose ingestions may cause immediate sickness in many animals. After recovery, this can cause an adverse reaction to baiting. Large animals and other small predators with highly active digestive systems often require relatively large amounts to be ingested in a short period in order to be fatal. In many cases, these animals could excrete low dosages of the material through normal elimination with no ill effects.

Secondary hazards to predator species appear to be greatly lessened by the tendency of gophers to die underground (Barnes, et al. 1985). EPA and U.S. Fish and Wildlife Service studies of strychnine baiting for gopher control found very minor losses to other than the target species when bait was correctly placed. Most of these losses were to burrow animals that intercept burrows or use food found underground. Small mammals that would readily eat the bait, such as ground squirrels, can be negatively affected in treatment areas (Anthony, et al. 1983). Secondary poisoning from predator prey relationships occur only from ingestion of material stored in the gophers' cheek pouches.

Under the Endangered Species Act, the Forest Service must request formal consultation and opinion (approval) to conduct management activities that may affect an endangered species.

A formal consultation for the grizzly bear and direct control of gophers by strychnine baiting has resulted in an opinion. The opinion requires the following:

(1) Use of strychnine baits is permitted in occupied grizzly habitats, with Regional Forester approval.

(2) Presently, review of Forest Service rodent control is required by the U.S. Fish and Wildlife Service.

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- ★- (3) A proposed treatment area is to be surveyed for grizzly sign and/or grizzlies prior to initiating a control program. If there is evidence that grizzlies are physically present in the area, a strychnine control program is not to be initiated, or if already initiated, the program must be discontinued if evidence indicates the presence of the grizzly.

Strychnine and other chemicals used in various control operations are often misunderstood, requiring an effective education program for the applicator and other publics. This program often needs to begin In-Service so that those most directly involved with the program understand and are committed to the program.

In all suppression actions, direct or indirect, the program objective is to alleviate reforestation damage. The killing of individual animals is only one of many alternatives. Direct suppression through baiting, because of its relative cost and efficiency, is often the least suitable alternative in the long run.

5. Prediction/Prescription Matrix

a. Ecological Considerations. Control of animal damage is most effective when based on sound ecological principles. The response of pocket gophers to timber harvest and reforestation is most influenced by the species of seral vegetation that revegetate logged sites, the composition and productivity of these plant communities, and the abundance of gophers or the proximity of populated areas before harvest. All of these factors may differ with habitat type, silvicultural method, and with the system of logging.

The habitat type classifies aggregates of land capable of producing similar plant communities at climax. This climax plant community reflects the integration of environmental factors on the resultant vegetation. One habitat type may support a variety of disturbance-induced, seral, plant communities. The classification of climax overstory and understory vegetation is possible at any successional stage because this vegetative succession, anywhere within one habitat type, ultimately produces similar communities at climax.

The variety of seral plants differs in composition, based on the habitat type, due to the variation of environmental interaction and the various plants' ability to cope with that environment. This composition is predictable. The variation in the seral plant communities' make-up causes a variation in the gophers' preference for that community. A stratification of communities associated with habitat types can be used to assess risk of gopher damage when allocating or planning for resource uses on a site. This determination will indicate where values and risks are the greatest.

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b. **Matrix Development.** The preference of pocket gophers for certain identifiable habitat types suggests the communities may be grouped into three classes:

Class 1. Those communities having moderate to high incidence of gophers in natural and disturbed stands.

Class 2. Those having a low incidence but a high potential for gopher occupancy.

Class 3. Those showing little observed gopher activity before and after activity or disturbance on the site.

The understory vegetation provides the principal means of identifying and mapping these communities, irrespective of their successional status. Consequently, expected tree mortality and necessary gopher control measures can be planned prior to harvesting Class 1 communities. Field identification of Class 1 sites becomes important in predicting post-disturbance infestation sources.

(Continued on next printed page.)

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COMMUNITY CLASS

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Control Option	Class 1			Class 2			Class 3	
	A	B	C	A	B	C		
<u>INDIRECT:</u>								N/A - Not Applicable P - Pre- treatment F - Followup
Herbicide	?	X	X	XP-F	XF	XF	?F	
<u>Silviculture Method</u>								
1 Shelterwood	N/A	N/A	N/A	X	X	X	X	
2 Selection	N/A	N/A	N/A	X	X	X	X	
3 Intermediate Treatment	N/A	N/A	N/A	X	X	X	X	
Size Planting Stock	X	X	X	X	X	X	X	*Dozer Stripping **Limit applica- tion Strip or spot.
Buffer Strips	N/A	N/A	N/A	X	X	?	X	
<u>Site Preparation</u>								
1 Mechanical*	N/A	N/A	N/A	X	X	X	N/A	
2 Hand	N/A	N/A	N/A	N/A	?	X	N/A	
3 Herbicides**	X	X	X	X	X	X	N/A	
Early Plant				X	X	X	X	
<u>DIRECT:</u>								
Hand and Machine Baiting	XP	XP-F	XP-F	XF	XF	XF	XF	
Trapping	?	N/A	?	N/A	N/A	N/A	X	
Plastic Tubes	N/A	X	X	X	X	X	X	
Monitor							Primary	

NOTE: Class 1 and 2 communities are further defined by the range within the classification. Class 1 A is the least typical of the type with the lowest perpetual gopher population. Class 1 B is the most typical. Class 1 C forms an intergrade between Class 1 and 2, being more commonly like Class 1 than 2. Class 2 has a similar classification system. (See text for details and examples.)

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Class 2 communities usually support impoverished herbaceous understories in the undisturbed condition. Burning or scarification will stimulate grass and forb production up to 10 times pretreatment levels. The burst of food supply makes these communities attractive to scattered, onsite gophers or those populations from adjacent Class 1 communities. For this reason, severe gopher damage within Class 2 communities is usually localized and must be treated as it occurs. In some instances, potential damage has been reduced in some areas by leaving near-natural buffer strips between Class 1 and 2 communities; this is a viable alternative.

Class 3 communities are dominated by shrubs such as manzanita, snowbrush, huckleberry, or herbaceous species such as Idaho fescue which are not preferred gopher food. Seral forbs created by disturbance seldom occur in this Class. Once identified, little consideration of gopher damage and control is necessary.

Examples of typical Class 1 communities are illustrated below. This list provides examples only. The classification of the habitat type or community as to class must be made at the Forest or District level based on evidence and/or experience.

Class 1 communities are often open stands where herbaceous material is predominantly fleshy-rooted forbs that are preferred by pocket gophers. Examples of the type: poorly stocked ABLA/CAGE habitat type, predominated by open grown lodgepole pine with clusters of lupine occurring throughout; mixed stands of various conifers and aspen present; large volumes of fleshy-rooted forbs are common in the aspen areas.

Class 2 communities are often dense old growth or densely stocked small saw timber or pole size stands with mostly dense sod-forming grasses. In some cases, these may be lightly stocked, composed entirely of bunchgrasses with few forbs or other vegetation present. When disturbed, dormant seed (soil-stored) will flourish, producing abundant moderate to highly desirable forbs, shrubs, or grasses. Some examples of the Class are: Douglas-fir/pinegrass that has been harvested using a number of silviculture systems with resultant fireweed, geranium, lupines, and pinegrass producing abundant growth. Often roads and skid trails are present that produce numerous annuals; Ponderosa pine/bitterbrush habitat that has been light harvested and disturbed often produces abundant forbs, especially lupine, or soil-stored forbs with bulbous early growth characteristics.

Class 3 communities are often dominated by brush species that sprout, sucker, or have root regenerating systems that allow rapid occupation of areas by brush. Brush communities which are sporadic in their occurrence or support both brush and grass-herbaceous cover will normally be in Class 1 or Class 2 communities, depending on the specific situation.

Some changes in Class may occur because of silvicultural activities that affect an area's ability to produce pocket gopher food plants.

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COMMUNITY CLASS

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Control Option	Class 1			Class 2			Class 3	
	A	B	C	A	B	C		
<u>INDIRECT:</u>								N/A - Not Applicable P - Pre- treatment F - Followup
Herbicide	?	X	X	XP-F	XF	XF	?F	
<u>Silviculture Method</u>								
1 Shelterwood	N/A	N/A	N/A	X	X	X	X	
2 Selection	N/A	N/A	N/A	X	X	X	X	
3 Intermediate Treatment	N/A	N/A	N/A	X	X	X	X	*Dozer Stripping **Limit applica- tion Strip or spot.
Size Planting Stock	X	X	X	X	X	X	X	
Buffer Strips	N/A	N/A	N/A	X	X	?	X	
<u>Site Preparation</u>								
1 Mechanical*	N/A	N/A	N/A	X	X	X	N/A	
2 Hand	N/A	N/A	N/A	N/A	?	X	N/A	
3 Herbicides**	X	X	X	X	X	X	N/A	
Early Plant				X	X	X	X	
<u>DIRECT:</u>								
Hand and Machine Baiting	XP	XP-F	XP-F	XF	XF	XF	XF	
Trapping	?	N/A	?	N/A	N/A	N/A	X	
Plastic Tubes	N/A	X	X	X	X	X	X	
Monitor							Primary	

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Class 2 communities are often dense old growth or densely stocked small saw timber or pole size stands with mostly dense sod-forming grasses. In some cases, these may be lightly stocked, composed entirely of bunchgrasses with few forbs or other vegetation present. When disturbed, dormant seed (soil-stored) will flourish, producing abundant moderate to highly desirable forbs, shrubs, or grasses. Some examples of the Class are: Douglas-fir/pinegrass that has been harvested using a number of silviculture systems with resultant fireweed, geranium, lupines, and pinegrass producing abundant growth. Often roads and skid trails are present that produce numerous annuals; Ponderosa pine/bitterbrush habitat that has been light harvested and disturbed often produces abundant forbs, especially lupine, or soil-stored forbs with bulbous early growth characteristics.

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Some changes in Class may occur because of silvicultural activities that affect an area's ability to produce pocket gopher food plants.

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(This publication is a state-of-the-knowledge report on available information on gopher biology, ecology, damage, and control. Habits and related problems are reviewed for gopher species throughout the United States, but attention is focused on the northwestern forest environments. A bibliography containing more than 1,000 literature citations is included.)

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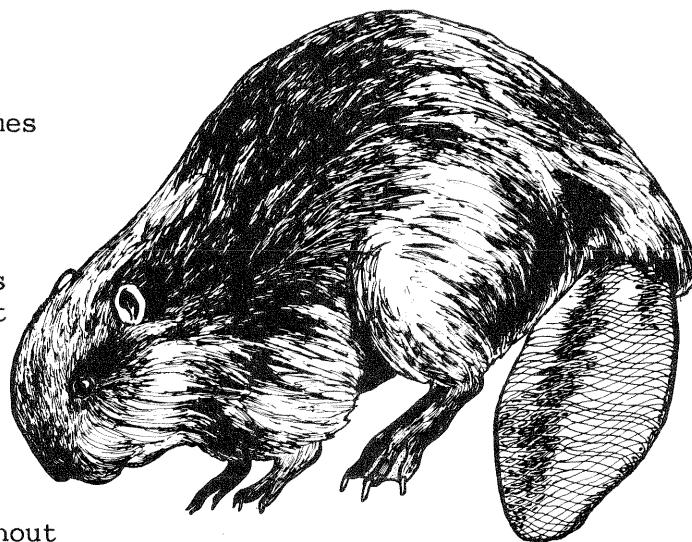
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52.25 - Beavers (*Castor canadensis*)

1. **Description.** The beaver is the largest rodent in North America, sometimes weighing over 60 pounds (27.2 kg). Its large size, flat scaly tail, and webbed hind feet easily distinguish the beaver from other native mammals and from the nutria, which has a round tail. Beavers are golden to dark brown above, somewhat lighter below.

2. **Economic Significance.** Beavers were exterminated from much of their former range by overtrapping, but with proper management, they have become reestablished and are now common throughout Region 6.



Beaver skins provide a minor source of income. Most pelts are used for making fur coats, hats, and for trimming cloth garments.

Beavers are noted for their dam building and tree felling activities that have both short- and long-term effects on the areas they occupy. Streams are slowed and usually warmed, streamside shade is reduced, vegetative structure is changed, water-born sediment is deposited in slack water of the ponds, stream courses are sometimes altered, and downstream flows are usually stabilized during the dry season.

Tree cutting damage is usually of less importance than the damage produced by the plugging of culverts and flooding of roads and timber stands as new ponds are created. Tree cutting by beavers is usually only a problem when trees are removed in campgrounds or scenic areas.

3. Life History Information

a. **Preferred Habitat.** Water courses with aspen, willow, cottonwood, and associated streambank vegetation are the most suitable sites. Smaller streams with flows from 2 to 12 second-feet (0.6-3.7 second-meters) are very attractive to beavers. Beavers are distributed throughout Oregon and Washington.

b. **Feeding Habits.** Bark, twigs, leaves, roots, and a wide variety of aquatic plants form the major part of the diet. Cottonwood, aspen, and willow are the principal tree species eaten. Conifers are occasionally eaten, but are not a staple food.

c. **Activity.** Dam building and feeding are done primarily at night. Travel is normally restricted to small areas around ponds or water courses. Young beavers dispersing from colonies may travel 30 to 50 miles (50-80 km) to find new habitat.

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d. **Reproduction.** Beavers are polygamous and mate once a year in late January or February. They are capable of breeding when 2 years old. From two to six kits are born in April or May after a 3-month gestation period. The young remain as part of the colony until 2 years of age before leaving to establish their own home.

4. Damage Problems and Their Control

a. **Identification.** Presence of characteristic beaver dams, and conical stumps with prominent tooth marks. Large wood chips present around stumps. Peeled sticks in or near water (Figure 50.7).

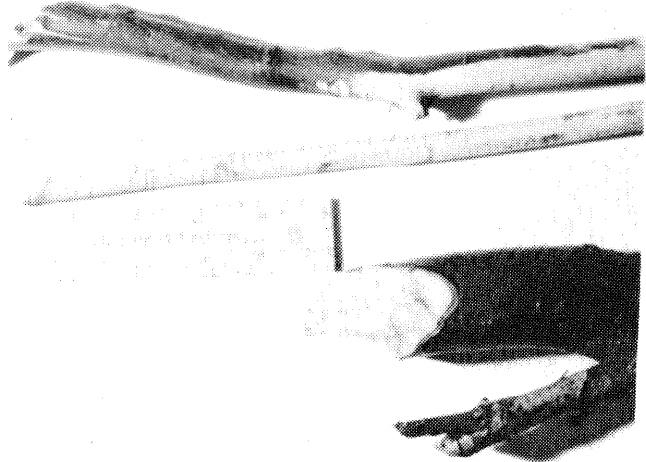


Figure 50.7. Beaver showing typical conical shaped stump (A), and peeled sticks with uniform horizontal toothmarks (B).

b. **Determining Need for Damage Control.** Beavers are valuable when their activities can be tolerated. When considering the need and method of control, it should be remembered that the ponds maintained by beavers generally have a high value as fishery and wildlife habitat.

c. Control Methods

(1) **Trapping** is the most effective method of removing individuals, but results may be only temporary. To remove problem beavers, get assistance from State Game Agencies or licensed private trappers to remove individual beavers.

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★- (2) **Fencing.** A fenced lane can be constructed that will effectively discourage beavers intent on plugging culverts or building dams in undesirable locations. (See 46.12 for design of beaver-baffler fence.)

(3) **Tree Skirting.** Preventing beavers from damaging individual trees in areas, such as, campgrounds requires intensive protective measures and continuous surveillance. Individual trees can be surrounded by a sheet metal or 2 x 2-inch (5 x 5 cm) wire fence built from the ground to a height of 3 feet (1 m). Even fencing may be ineffective in deep snow.

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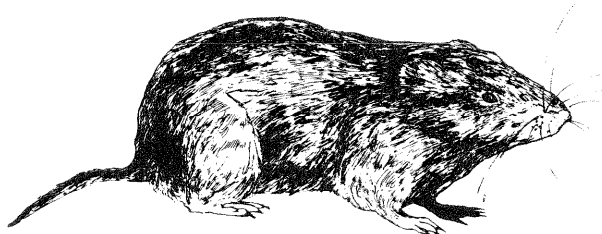


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52.26 - Mice52.26a - Meadow Mice (Microtus sp.)

1. **Description.** These voles are mostly brownish gray in color with dense fur, bead-like eyes, small ears, and relatively short tails. Vole presence is indicated by 1-2 inch (2.5-5.0 cm) wide runways through matted grass. Further evidence includes small piles of droppings and short clippings of grass along these runways. Lemmings, phenacomys, and redback voles may be confused with Microtus spp. Individual species coloration is the main distinguishing factor.



2. **Economic Significance.** Meadow mice are detrimental to many agricultural crops during the period when their populations are high. They also eat conifer seeds, newly germinated seedlings, and bark of young trees. They can cause serious damage to conifer plantations, especially under snow in winter.

3. **Life History Information**

a. **Preferred Habitat.** Meadow mice occur in a variety of sites with sufficient vegetation to provide food and cover. Grassy areas provide the most desirable habitat.

b. **Feeding Habits.** Vegetation, including grass, herbaceous foliage, twigs, roots, seeds, and bark are eaten.

c. **Activity.** Meadow mice are active both day and night throughout the year. Their presence is readily detected by distinct winding runways beneath the vegetation. Each mouse usually maintains its own set of runways, but its territory may be occupied by several mice. Individual home ranges vary from a few square feet to areas as large as 0.1 acre (0.4 ha).

4. **Damage Problems and Their Control**

a. **Identification.** Barking of small limbs and seedlings is characterized by indistinct tooth marks and a fuzzy, roughened appearance (Figure 50.8). Areas of dense ground vegetation have numerous distinct runways.

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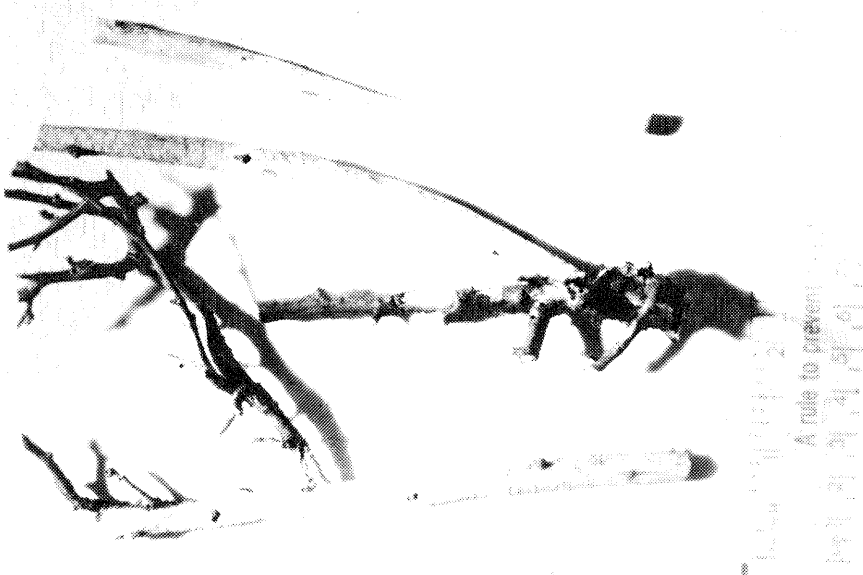


Figure 50.8. Barked seedlings showing typical roughened stem.

b. **Determining Need for Damage Control.** Meadow mouse populations fluctuate dramatically, often causing damage at high levels, with populations dropping after damage is noticed and before control is undertaken. When considering a control operation, be sure to verify that a problem still exists, as the population can crash in a matter of months.

c. **Control Methods**

(1) **Baiting.** Meadow mice usually can be controlled with 1-percent zinc phosphide-treated wheat. Distribute the bait in quantities of one-half teaspoonful directly in runways and burrows. The quantity of bait needed per acre will vary depending upon mouse density, distribution, and density of cover.

Two pounds of bait per acre (3.25 kg per ha) normally will be enough to control high populations in dense cover. Correct bait placement is very important, as the mice seldom venture from the protection of their runways. Baiting is most effective in late fall. Baiting may be needed for several years in problem areas.

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(2) **Habitat Manipulation.** Removing food and cover is an effective method for controlling damage meadow mice, but it may have adverse effects on other wildlife. This approach to damage control is most applicable in old fields and other areas with dense grass cover. Habitat manipulation can be accomplished by grazing, cutting, cultivating, or spraying with herbicides.

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52.26b - Deer Mice (Peromyscus maniculatus)

1. **Description.** Deer mice are the most widely distributed members of this genus. Deer mice are distinguished from other mice by large membranous ears. Color is yellowish brown to grayish above, white or gray under-parts; feet white. The tail is sharply bicolored, white below and dark above. Total length is about 7 inches (15-20 cm); tail is nearly half of total length.



2. **Economic Significance.** Deer mice are considered the most devastating of the seed-eating rodents. Field studies have shown that they eat and cache large quantities of conifer seed and that even one or two mice per acre can seriously delete natural seed fall or artificial seeding.

Insects constitute an important part of the deer mouse's diet.

3. Life History Information

a. **Preferred Habitat.** Deer mice occupy nearly all habitat types on forest lands in Region 6. Their need for cover is not as critical as that of meadow mice and shrews. Large numbers of deer mice are often found on burned areas, even though ground cover may be sparse.

b. **Feeding Habits.** Seeds, other fruits, and insects provide the major source of food. Coniferous seeds usually are readily accepted, especially seeds of Douglas-fir and pine.

c. **Activity.** Deer mice are active throughout the year. They are primarily nocturnal. The average home range is about 4 acres (1.6 ha).

d. **Reproduction.** Litter sizes vary from three to seven, and an average of four litters is born each year. The gestation period is from 22 to 25 days. Young mice may breed when 6 to 8 weeks old. The population usually peaks in November.

4. Damage Problem and Their Control

a. **Identification.** Conifer seeds are eaten by gnawing a small irregular hole in one end or side of the hull, and removing the embryo (Figure 50.9).

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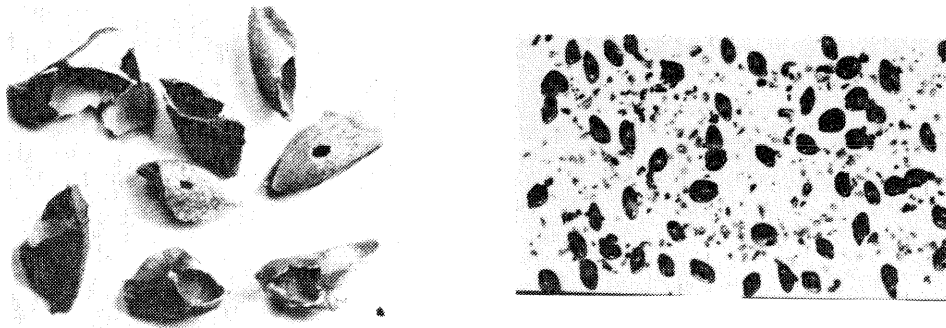


Figure 50.9. Douglas-fir seeds (left) and ponderosa pine seed (right) opened by deer mice.

Deer mice typically open one edge of the seed, remove the endosperm, and leave an empty boat-shaped hull with clean-cut edges at the opening. A small irregular hole often is made in one side of the seed coat.

b. **Determining Need for Seed Protection.** Small-mammal populations normally exceed the minimum density required to consume or cache most of the seed distributed in direct seeding. Density of deer mice alone is rarely below 1 per acre on forest lands, which is sufficient to cause significant seed depredations (Hooven 1958, Moore 1940). Thus, successful establishment of broadcast seeded Douglas-fir is unlikely if acceptance rate of seed spots (see 32.23) exceeds 5 percent or more of the seed spots in one night (Moore 1940).

Assuming that a 5-percent catch of seed-eating mammals is comparable to a 5-percent rate of seed-spot acceptance, seed protection would be required whenever the catch on Trapline Transects (see 32.12) exceeded 5 per 100 trap nights.

c. Control Methods

Seed Protection. No chemical treatments are currently recommended.

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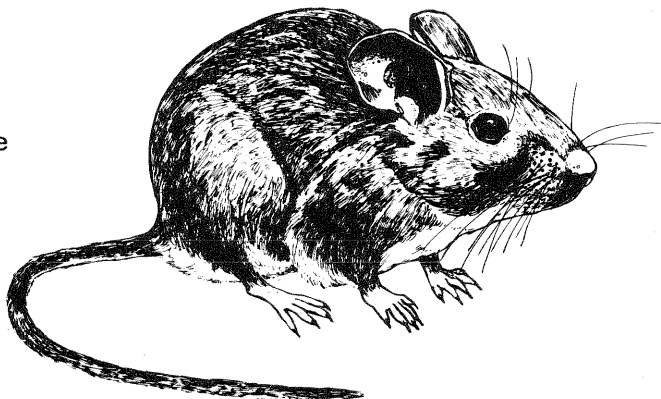
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52.27 - Wood rats (Neotoma spp.)

1. **Description.** Wood rats, otherwise known as "pack rats," are often confused with the Norway rats. They are easily distinguished from the latter by the hairy, unscaled tail and soft, fine fur covering the body. The wood rat also has large ears and usually white feet and underparts.



2. **Economic Significance.** The dusky-footed wood rat occasionally strips bark from the crowns of young conifers for nest material. This injury usually occurs in dense, 10- to 30-year old stands and is seldom widespread. Both the dusky-footed and bushy-tailed wood rat cause problems in buildings by fouling stored materials and food supplies.

3. Life History Information

a. **Preferred Habitat.** Wood rats may be found in forest habitats throughout their range.

b. **Feeding Habits.** Primary foods are green foliage, fruits, and seeds. Food is stored for winter use.

c. **Activity.** Wood rats are mostly nocturnal. Bulky nests are built primarily of sticks and are lined with various shredded materials, including tree bark and moss.

d. **Reproduction.** Normally, only one litter is born per year. The gestation period is about 30 days. Litters vary from two to four.

4. Damage Problems and Their Control

a. **Identification.** Wood rats characteristically build large bulky nests in caves and buildings. The bushy-tailed wood rat also builds nests on the ground and in the crowns of trees. A musty odor and oblong fecal pellets about 1/2-inches (1.2 cm) long are generally apparent wherever wood rats are present. The dusky-footed wood rat occasionally will damage sapling and pole-size conifers by barking and girdling of the upper boles and limbs in 10- to 30-year-old stands of conifers (Figure 50.10). Much of the bark that is used for nest building is removed without exposing the sapwood, whereas feeding injuries of most rodents expose the sapwood.

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Figure 50.10. Barking by wood rat showing patchy appearance and toothmarks in sapwood. Much of the outer bark is removed without removing sapwood.

b. **Determining Need for Control.** Control of offending individuals is the best approach. Preventive control is only effective in and around buildings. Damage in second-growth stands is sporadic, with the stand growing beyond a susceptible size in about 30 years.

c. **Control Methods**

(1) **Baiting.** Anticoagulants can be used to control wood rats in buildings, but no baits are registered for controlling wood rats on National Forest lands in the field (see 41.23).

(2) **Trapping.** In buildings, a trap set that is particularly effective for capturing wood rats is the stovepipe set. Place a section of stovepipe 6 inches (15 cm) in diameter along a wall and set a Conibear 101 or a No. 0 jump trap in it (see 44.1). Bait the trap with nutmeats or raisins. A board leaned against the wall to form a tunnel may also be used. Seal all points of wood rat access, to prevent re-entry.

(3) **Shooting.** Shooting is usually ineffective as a control. It can be done on a limited basis, but is generally only a temporary measure.

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52.28 - Mountain Beavers
(*Aplodontia rufa*)

1. **Description.** Mountain Beavers are about the size of muskrats. They have rounded ears, small eyes, and short, stubby tails. Color is blackish-brown all over, except for a whitish spot below the ear. There are five toes on each foot with the reduced thumb lacking a claw. Size, color, and lack of a tail distinguish it from other mammals within its range.



2. **Economic Significance.** Mountain beavers rarely cause damage to mature trees. However, they cause serious damage to Douglas-fir plantations during establishment, which may continue through sapling and pole stages of development. Lateral and terminal branches may be removed from trees up to 10 feet (3 m) in height. Basal barking and undermining of tree roots frequently occurs in young growth stands. This damage often is not detected until after precommercial thinning; in some instances, thinning may stimulate damage. Burrowing activities of mountain beavers occasionally undermine road beds, irrigation ditches, and earth dams.

3. **Life History Information**

a. **Preferred Habitat.** Distribution is limited mainly to western Oregon and Washington, although the range of the species extends from southern British Columbia to central California. Mountain beavers are found in suitable forested habits throughout their range; mountain beaver populations thrive on suitable sites on cutover areas. Populations are most abundant near streams and on areas with moist, deep soils.

b. **Feeding Habits.** Mountain beavers are herbivorous and eat a wide variety of herbaceous and woody plants. Sword fern and bracken fern comprise an important part of their diet throughout the year. Feeding is primarily at night, with foraging occurring within a few feet of a tunnel exit.

c. **Activity.** Most surface activity takes place at night, but movements within the extensive burrow system may occur during the night or day. Although mountain beavers do not hibernate, their activities in many areas are restricted in the winter. Some burrowing may occur in the snow. Late spring is the season of greatest burrowing activity.

The burrow system consists of extensive irregular tunnels, 6 to 8 inches (15-20 cm) in diameter. These tunnels form a network of passages from a few inches to several feet beneath the ground surface. There are many entrances and unrepaired roof openings. A typical burrow system occupies about 0.3 acre (0.1 ha), ranging from 0.1 to 0.5 acres (0.04-0.2 ha) in size. Burrow systems may overlap. Each system is occupied by a single mountain beaver, except during the spring and summer when juveniles occupy a system with an adult female, before dispersing.

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The nest is a deep and fairly elaborate structure containing numerous layers of packed leaves and other foliage.

d. **Reproduction.** Breeding takes place once a year in late February or early March. From two to four young are born after a gestation period of 28 to 30 days. Females do not bear young until they are in their second year.

4. Damage Problems and Their Control

a. **Identification.** The presence of active mountain beaver burrow systems is generally evident. Mountain beaver clipping leaves an oblique cut characteristic of rodents, but it usually can be distinguished from clipping by other animals because of the multiple cuts, which leave a serrated cut-end. On larger seedlings the laterals are frequently clipped off, leaving 1 to 3-inch (2.5-7.5 cm) stubs. Basal girdling may occur on sapling and small pole-size trees. Superficially, the basal girdling may look like bear damage; however, mountain beavers do not leave any discarded bark at the base of the tree. Mountain beavers leave scattered horizontal and diagonal tooth marks, whereas black bears leave vertical incisor marks when scraping the sapwood (Figure 50.11).

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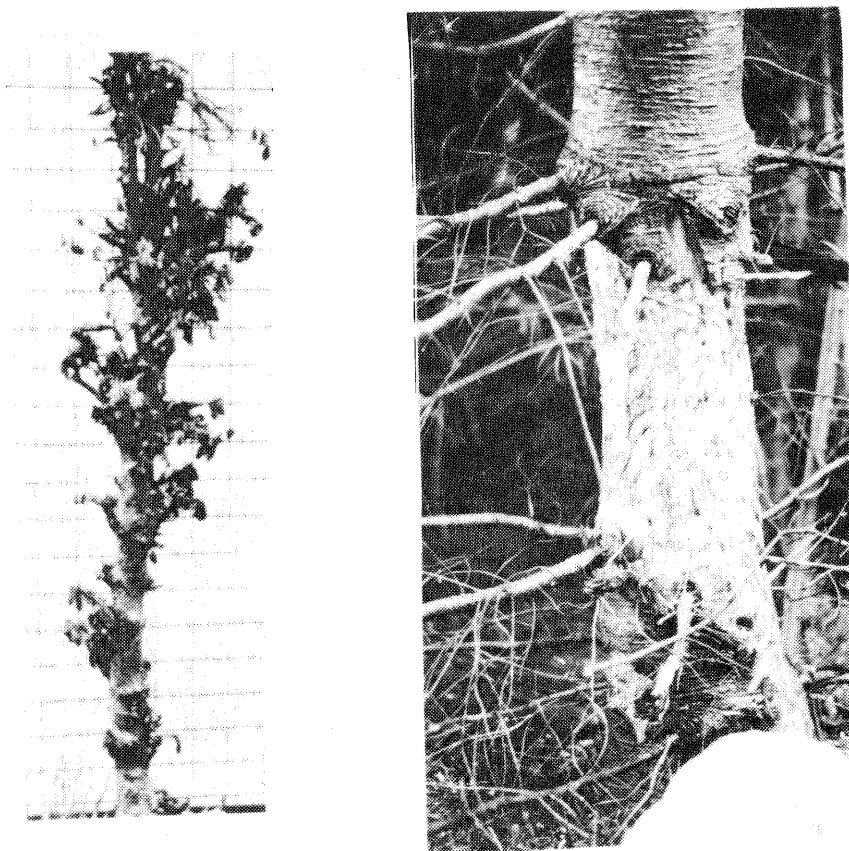


Figure 50.11. Clipping and barking damage caused by mountain beavers showing characteristic 1 to 3-inch (2.5 to 7.5 cm) stubs after clipping limbs (A) and basal girdling (B).

b. **Determining Need for Damage Control.** Whenever an active burrow system exists, the potential for clipping of young seedlings exists in the vicinity. When the population of mountain beavers exceeds two per acre, a high rate of clipping can be expected, unless some method of damage control is undertaken. Figure 50.12 shows the relative costs and degree of protection that could be expected on clearcut areas with a population of three to five mountain beavers per acre.

If planting is being contemplated in the immediate vicinity of active mountain beaver burrow systems, some method of damage prevention is almost mandatory.

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Figure 50.12. Estimated cost and effectiveness of three control methods on an area with a moderate to high population (3-5 active burrow systems per acre) of mountain beaver.

Control Treatment	Est. Costs of Control (1976)	Expected Terminal Clipping 1 Year After Planting (Percent)
None	None	50-80
30" tubes	35 cents/tree	1-4
18" tubes	32 cents/tree	2-5
16" tubes	30 cents/tree	10-15
10" tubes	27 cents/tree	20-30
Broadcast burn	None	20-30
Trap	\$35-\$45/acre	10-25
Trap and broadcast burn	\$25-\$30/acre $\frac{1}{-}$	4-8

$\frac{1}{-}$ The cost of broadcast burning was not included as a cost to mountain beaver control.

c. Control Methods

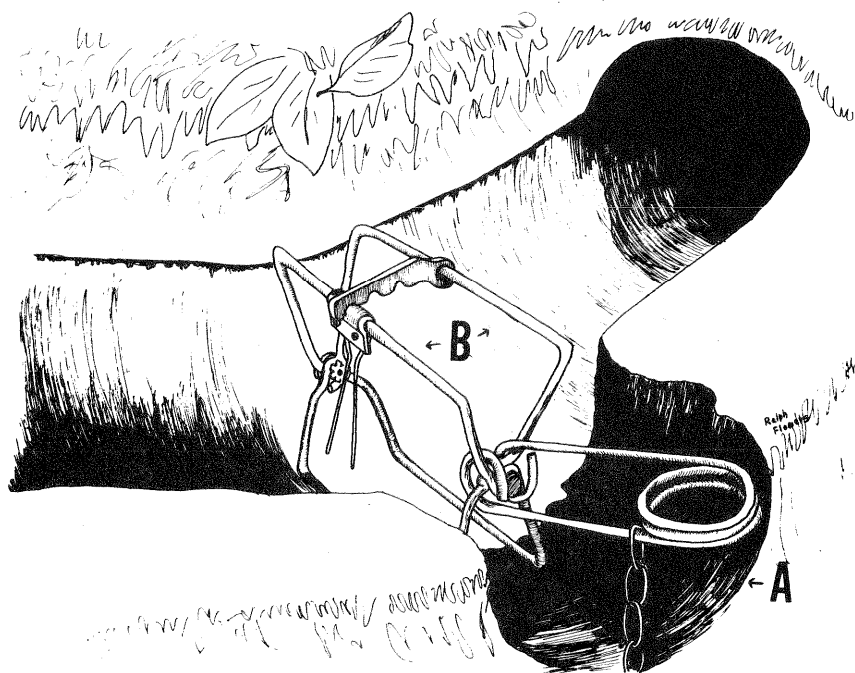
(1) **Chemicals.** No Federally-registered rodenticides are available for use in control of mountain beavers on National Forest lands in Region 6.

(2) **Trapping.** Trapping is the most effective method available for controlling mountain beavers. Conibear Model 110 traps set upright and at right angles to the underground runways are recommended. Figure 50.13 shows a typical set with three anchor stakes; Figure 50.14 shows a modified set with two stakes. Traps should be set in a main runway of an active burrow. Before setting a trap in a burrow, be certain that the opening is not a lateral exit burrow used for pushing-out soil or plant debris. Secure traps with stakes and chains. There is no need to conceal or cover traps. Check traps and reset as needed after the first trap night, to ensure maximum effectiveness of traps.

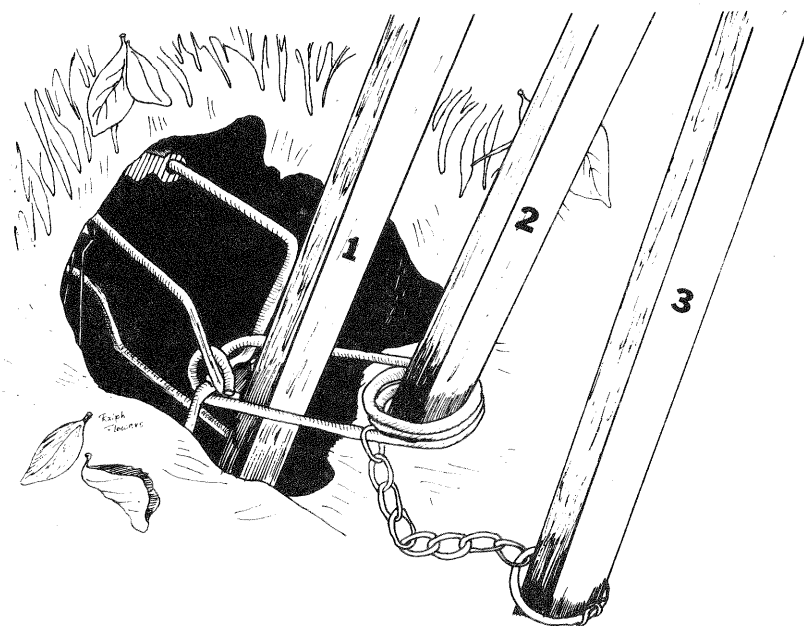
Consider trapping on areas over 5 acres (2 ha); smaller areas that need buffer are often too expensive to trap. Set three to five traps per burrow system or 20-25 traps per acre (50-60 per ha) when four to five burrow systems are found in typical mountain beaver habitat. One person can set 40-50 traps and check an additional 50 traps per day. Use Conibear 110 trap set in a main runway. Nontarget species normally will constitute about 3-6 percent of the total catch.

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(A) Conibear trap set for mountain beaver showing lateral runway "A" and main runway "B" where trap is placed.



(B) Method of securing Conibear set for mountain beaver, showing stakes used to anchor trap body (1), trap spring (2), and trap chain (3).

Figure 50.13. Mountain beaver set showing: (A) placement and (B) position of anchor stakes.

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- *-Most animals (90 percent) are caught in the first 1 or 2 days. Leaving the traps set for 4 to 5 days before removing them increases the chances of catching those animals that may have avoided traps, or not encountered traps during the first part of the trapping period. During spring and summer trapping, juveniles are likely to occupy the burrow systems with adults. This necessitates an additional trap check after the first day, to remove animals caught and to reset traps to catch mountain beaver remaining in burrow systems having multiple occupants.

During September and October, active mountain beaver signs may not be readily apparent. The lack of active signs can result in reduced trapping efficiency during this period. Scheduling of trapping operations should be delayed for at least 3 to 4 weeks after burning an area, to allow development of new activity. If trapping is attempted immediately after burning, many active mountain beaver burrow systems may be overlooked.

Trapping should be completed before planting, preferably as close to planting time as possible. For most effectiveness, trapping should be completed no sooner than 6 months before planting. Where adjacent populations exist, a 300-foot (100 m) wide buffer strip should be trapped in occupied habitat.

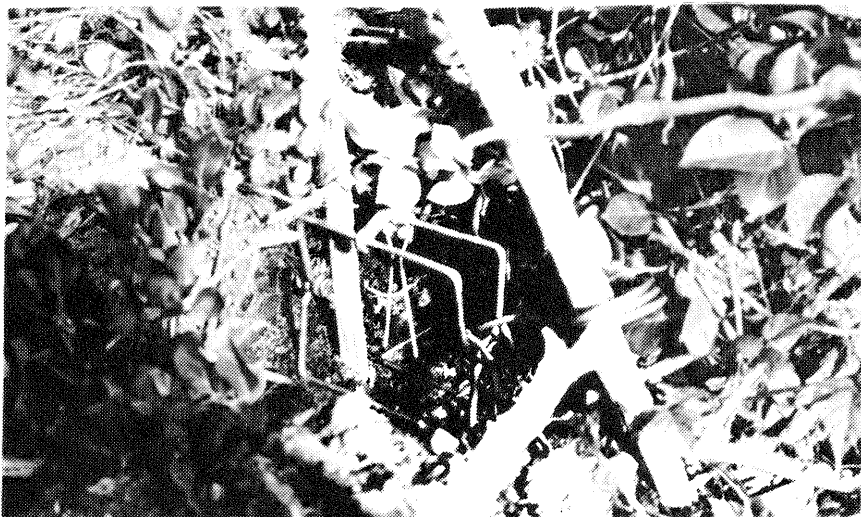


Figure 50.14. Mountain beaver field set with two anchor stakes.

(3) **Tubing Trees for Protection from Mountain Beaver.** Tubing should be considered as an alternative to trapping in small areas of less than 5 acres (2 ha). Use plastic tubing, from 18 to 24 inches (45-60 cm) high, anchored with a single wire pin or wooden stake. See 46.31 and 63.1 for details.

ANIMAL DAMAGE CONTROL HANDBOOK

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ANIMAL DAMAGE CONTROL HANDBOOK

52.29 - Porcupines (Erethizon dorsatum)

1. **Description.** The most distinctive characteristic of this large, yellowish-black rodent is the stiff quills, especially on the rump and tail. They weigh up to 33 pounds (15 kg).

2. **Economic significance.** Porcupine damage has been a major problem throughout much of the pine region in Region 6. However, it is now only a minor problem in localized stands in the Region.

Clipping and basal barking by porcupines on seedlings and saplings often kills the trees. Gophers cause similar damage. Barking of the upper portions of older trees results in deformities that reduce commercial value. The majority of feeding on conifers occurs from late summer through winter.

Occasionally dogs, livestock, and wild animals succumb because they are blinded or unable to feed after an encounter with a porcupine.

Porcupines also cause nuisance damage around campgrounds and administrative sites. Harnesses, tool handles, automobile tires, and other objects with deposits of salt or other attractants on them are often damaged.

3. Life History Information

a. **Preferred Habitat.** Conifer forests where there are rock outcrops or old trees and logs suitable for dens are favored areas.

b. **Feeding Habits.** Bark, buds, grasses, and forbs are taken seasonally. Bark feeding usually does not start until late summer after herbaceous vegetation becomes mature and dry.

c. **Activity.** Porcupines actively forage from dusk through early morning. Daily travel is limited and animals often remain in one area for many days.

d. **Reproduction.** A single young is born each year during May or June, after a gestation period of about 7 months. The minimum breeding age is 1 year, with most females breeding each year.



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★- 4. Damage Problems and Their Control

a. **Identification.** Porcupine use is characterized by prominent horizontal tooth marks, 1/8-inch (.3 cm) wide in the sapwood (Figure 50-15). On larger, heavily barked trees, pieces of the outer bark, 1/2 to 1 inch (1.2-2.5 cm), are often found at the base of trees. Clipped conifer needles, quills, and large oblong droppings 1-inch (2.5 cm) long also indicate porcupines.

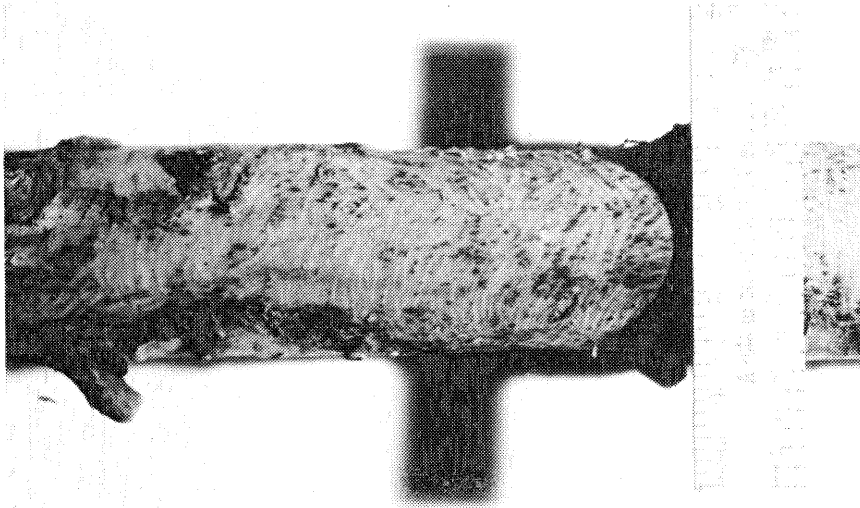


Figure 50-15. Porcupine barking showing prominent horizontal and diagonal tooth marks.

b. **Determining Need for Damage Control.** Porcupine damage can occur throughout the porcupine's range, but is most prevalent in stands less than 18 inches (46 cm) DBH. The impact of damage on a given stand depends on stand density. Porcupine damage control probably should be considered in managed stands with 3 percent or more annual damage. Annual damage of less than 1 percent per year may be very conspicuous, but probably doesn't warrant the effort and expense of a porcupine control program.

c. **Control Methods.** A combination of control techniques may be required to provide effective control.

(1) The most specific method is hunting during the winter, when the areas receiving damage can be visited and particular depredating porcupines removed.

(2) Porcupines can be easily caught with a No. 2 jump trap, or a Conibear 330 trap (see 44.1). Many of the normal precautions used in making trap sets for furbearers such as coyotes and bobcats, can be purposely omitted to avoid unwanted catches of these predators. Most large predators avoid a trap unless it is set with utmost care. If there is a risk of taking nontarget species, another control technique should be used or the trap should be left exposed.

Trap sets should be baited with a fetid scent. The scent should be deposited on solid objects close to the trap. Apples are an attractive bait.

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- ★ Scent station sets can be inconspicuously located in areas of concentrated damage (see Figure 50.16). Any material with a fetid odor such as rotted fish or meat should be placed in the center of the station. The station is designed to reduce the chances of nontarget species being trapped, while attracting porcupines to enter the station.

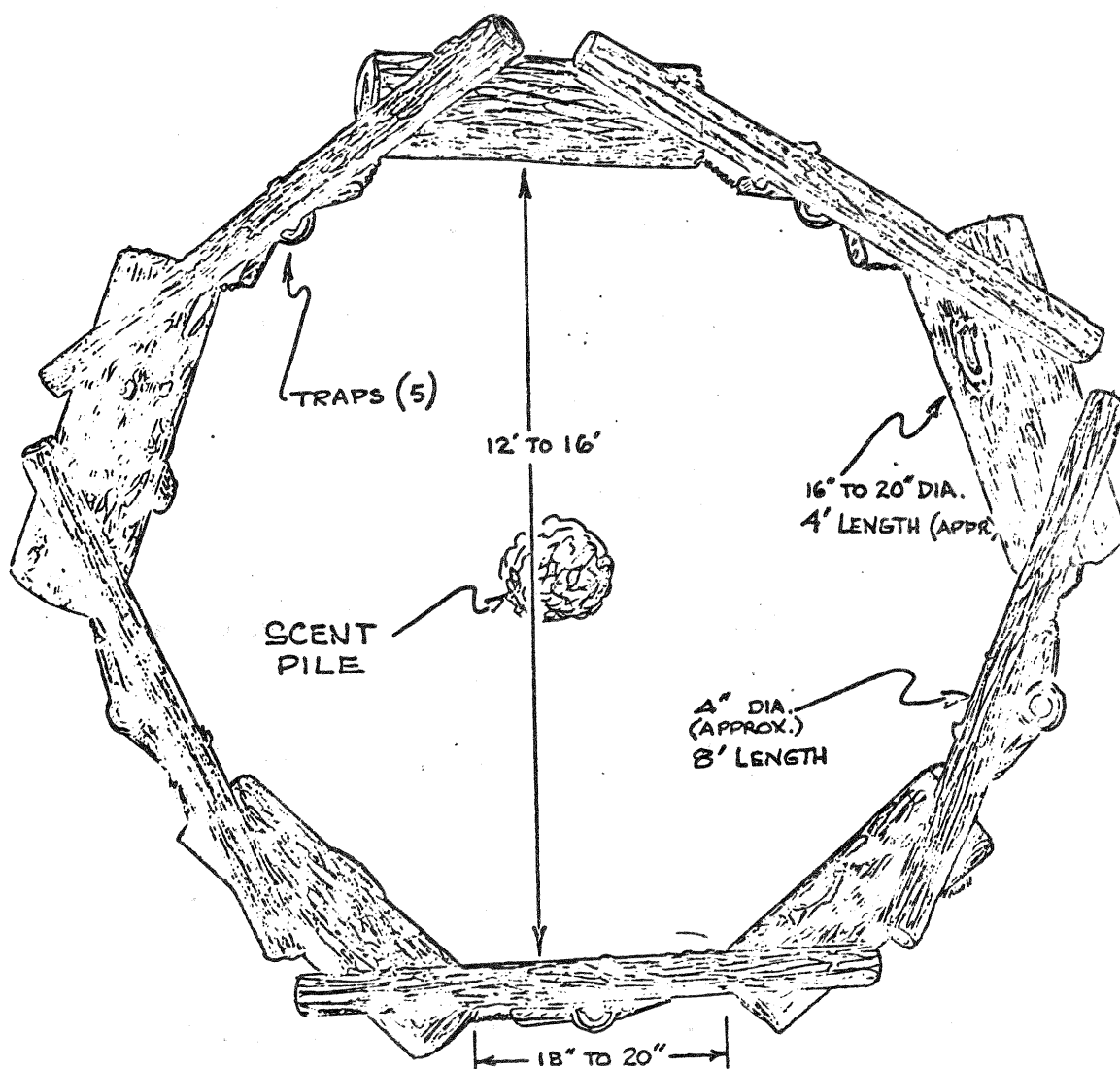


Figure 50.16. Traps set in a porcupine scent station set.

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(3) **Hunting.** Porcupines may be controlled effectively by hunting (see 43.3):

(a) Daytime hunting can be done in the early spring when vegetation begins to develop. Look for porcupines where they feed in meadows, along streams, and in open grass and weed-covered ridges in the early morning and late evening.

(b) Night road hunting is recommended during the breeding season in late summer and early fall.

(c) Daytime hunting is most successful on tracking snow during late fall, winter, and early spring. Porcupines are usually active after a snow storm, and tracks and fresh droppings are easily seen.

(4) **Baiting.** Strychnine-treated salt blocks are registered for use in roost trees, but are seldom effective.

(5) **Biological Control.** Fishers are natural enemies of porcupines and should be protected where they occur.

(6) **Plastic Tubing.** Plastic tubing can be used for protection of young seedlings (see 46.31).

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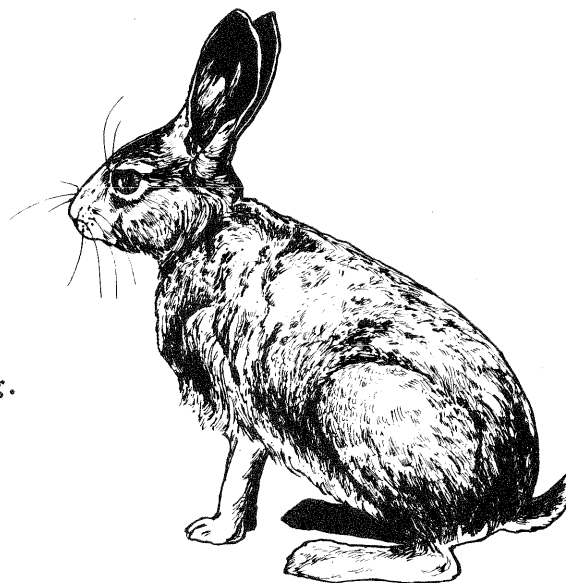
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ANIMAL DAMAGE CONTROL HANDBOOK

★- 52.3 - Rabbits and Hares52.31 - Snowshoe Hares (*Lepus americanus*)

1. **Description.** Also known as the varying hare, most subspecies of this large-footed hare turn white during the winter and dark brown in summer. Its ears are relatively short (3-1/2-4 inches (9-10 cm)) for a hare. Head and body length is between 13-18 inches (33-46 cm). Main distinguishing feature is coloring.

2. **Economic Significance.** Snowshoe hares provide a limited amount of sport hunting in parts of Region 6. The importance of this sport can be expected to increase in the future as hunting pressure increases and habitat for other game species becomes limited.



Hares provide much food for large predators, and in this way act as an important buffer species for other game animals.

In localized areas of Region 6, hare damage to conifer plantations is more critical than that caused by big game. Clipping by hares or rabbits often results in loss of seedlings rather than the temporary suppression of growth that occurs with browsing damage.

3. **Life History Information**

a. **Preferred Habitats.** Snowshoe hares occupy most commercial forest lands in Region 6, where there is an abundance of good protective cover.

b. **Feeding Habits.** Hares prefer a woody diet of foliage, stems, and bark of shrubs and trees throughout most of the year, although herbaceous vegetation is the main food in summer.

c. **Activity.** Daily movements usually are limited to a small area. The period of greatest activity is from dusk to dawn. Snowshoe hares do not migrate, but may shift their feeding activities to different vegetative types during deep-snow conditions in winter.

d. **Reproduction.** Snowshoe hares normally have three to four young per litter, and may have up to four litters a year. Young are born from April through August. The gestation period is from 36 to 40 days. The newborn young are well developed and are soon able to move about.

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4. Damage Problems and Their Control

a. **Identification.** Snowshoe hares clip seedlings and limbs up to 1/4 inch (0.6 cm) in diameter. The stub remaining after clipping has an oblique cut on the end (see Figure 50.17). Occasionally, barking will occur during the winter on hardwoods and conifers when other vegetation is unavailable. The fecal pellets of snowshoe hares are round, and about 3/8 inch (0.9 cm) in diameter.

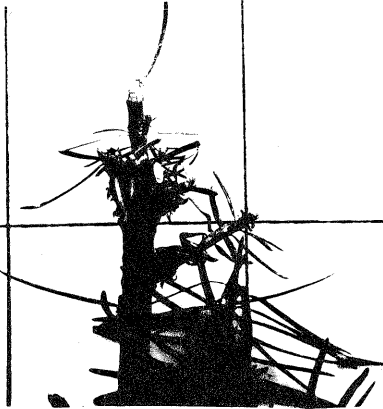


Figure 50.17. Hare clippings showing characteristic 45° angle of cut branch.

b. **Determining Need for Damage Control.** Damage by snowshoe hares is usually localized. The most serious problems generally occur when replanting an area that has been clearcut long enough (3-7 years) to allow a heavy build-up of vegetative cover and hares.

c. Control Methods

(1) **Baits.** No Federally registered rodenticides are available for control of hares on National Forests in Region 6.

(2) **Silvicultural Practices.** Disposing of slash, brush, and accumulations of logging debris will reduce the attractiveness of the habitat for hares. When a serious hare-damage problem is anticipated, use large diameter seedlings with a caliper of 5 to 7 mm. Do not use containerized seedlings without plastic protectors.

(3) **Repellent (Thiram).** Plant trees that have been treated with Thiram-animal repellent. Repeated applications of Thiram in the field may be required after each growing season, until trees grow large enough to be out of danger. The repellent can be applied effectively with a back-pack sprayer. The recommended dilution is 1 gallon (3.8 l) of 20-percent Thiram to 1 gallon (3.8 l.) of water (see 42.2).

(4) **Plastic Tubing.** Plastic tubing 18 inches (46 cm) high also may be used to protect individual tree seedlings. The tubes can be placed on newly planted or established seedlings and will provide protection of new and old foliage from clipping by hares (Campbell and Evans 1975, see 63.1).

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- ★- (5) **Vegetation Control.** Herbicides, such as atrazine, have been used to reduce herbaceous hiding cover to low level, which tends to discourage occupancy of the area by snowshoe hares. Borrecco (1976) found a significant reduction in hare numbers and tree mortality on areas where vegetation was controlled.

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★- 52.32 - Black-Tailed Jackrabbits
(Lepus californicus)

1. **Description.** The black-tailed hare or jackrabbit may be found throughout the grasslands and open areas of the West. It also occurs in less abundance on forest land, especially on clearcuttings and partial cuttings. It is grayish dorsally, and nearly white beneath. Its conspicuous, large (6-7 inches; 15-18 cm), black-tipped ears and black streak on top of the tail distinguish it from all other hares.

2. **Economic Significance.** The black-tailed jackrabbit has occasionally been reported clipping seedlings in pine plantations that are adjacent to grasslands or shrub communities.

3. **Life History Information**

a. **Preferred Habitat.** Grassland and sagebrush areas of Oregon and south central Washington.

b. **Feeding Habits.** Forbs and grasses are dominant in the diet during spring and summer months. During the fall and winter, shrubs are dominant in the diet.

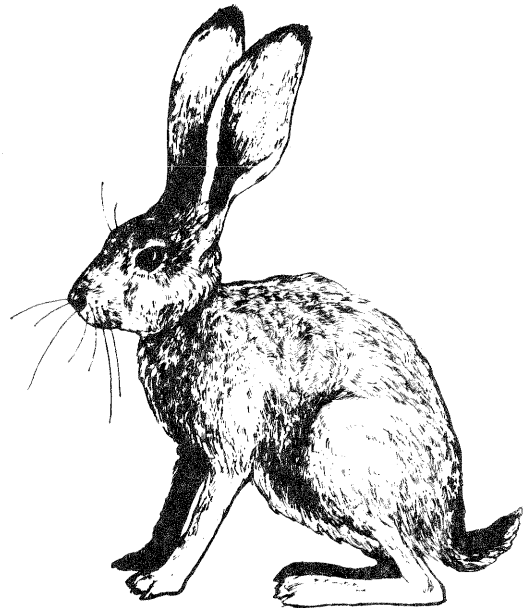
4. **Damage Problems and Their Control**

a. **Identification.** On shrubs and tree seedlings, the obliquely-cut stem helps identify clipping by black-tailed jacks. The sighting of jackrabbits and occurrence of round fecal pellets are indications that black-tailed jackrabbits are in the area. Range areas can utilize forage cages to determine forage use.

b. **Determining Need for Damage Control.** Damage is localized, and has been reported only sporadically. On winter sheep range, one study in Utah estimated 5.8 jackrabbits consumed forage equal to one sheep.

c. **Control Methods**

(1) **Repellent (Thiram).** Thiram is registered for use as a rabbit repellent. Repeated applications may be needed each year to insure adequate protection. (See 42.2).



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(2) **Plastic Tubing.** Plastic tubing can be used to effectively prevent clipping. Tubes (30" in size) should be placed over the seedlings when planting or replanting damage areas. (See 46.31.)

(3) **Silvicultural Practices.** Use of seedlings over 60 cm in height may reduce clipping.

(4) **Baits.** No lethal baits are registered for use on National Forest lands to control black-tailed jackrabbits.

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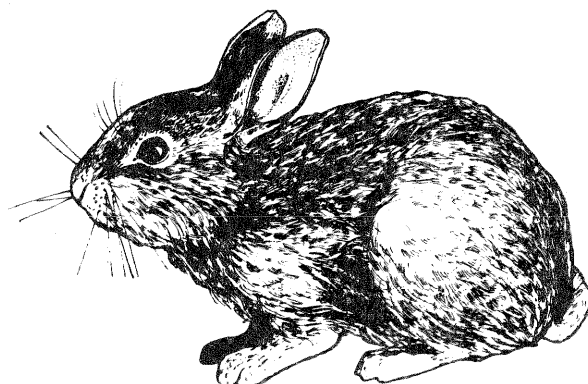
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★- 52.33 - Brush Rabbits
(Sylvilagus bachmani)

1. **Description.** The small brown brush rabbit has short ears and tail. It rarely uses burrows; instead it makes runways through thick grass or other vegetation. It can be distinguished from the desert cottontail and black-tailed jackrabbit by its smaller size.



2. **Economic Significance.** The brush rabbit is of minor importance in providing hunting opportunities on National Forest lands in Region 6. The denseness of the habitat that it occupies makes both hunting and viewing quite difficult.

3. Life History Information

a. **Preferred Habitat.** Dense brush interspersed with openings provides ideal habitat. Distribution extends through western Oregon.

b. **Feeding Habits.** Buds, twigs, bark, grasses, and a wide variety of succulent forbs are eaten.

c. **Activity.** The main period of activity is from dusk to dawn. Movements are confined to very small areas.

d. **Reproduction.** Brush rabbits normally have from three to four litters per year, with from three to six young per litter. The young are born hairless and blind, and spend a much longer time in the nest than hares.

4. Damage Problems and Their Control

a. **Identification.** Brush rabbits clip seedlings and small limbs up to 1/4 inch (0.6 cm) in diameter, leaving an obliquely-cut stem. (Appearance of clippings are similar to those made by snowshoe hare as shown in Figure 50.17.) Their fecal pellets (droppings) are round and about 3/8 inch (.9 cm) in diameter.

b. **Determining Need for Damage Control.** Damage is localized with past history being the best indicator of potential problems.

5. Control Methods

a. **Silvicultural Practices.** Disposing of slash, brush, and accumulations of logging debris reduces the attractiveness of the habitat for rabbits. When a serious rabbit damage problem is anticipated, use of seedlings 2 or more feet (60 cm) in height will reduce feeding damage.

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b. **Repellent (Thiram).** In areas exposed to damage by rabbits, plant trees that have been treated with Thiram-animal repellent. Repeated applications of Thiram in the field may be required after each growing season, until trees grow large enough to be out of danger. The repellent can be applied effectively with a back-pack sprayer. The recommended dilution is 1 gallon (3.8 l.) of 20 percent Thiram to 1 gallon (3.8 l.) of water (see 42.2).

c. **Plastic Tubing.** Plastic tubing also may be used to protect individual tree seedlings. The tubes can be placed on newly planted or established seedlings and will provide protection of new and old foliage from clipping by rabbits (Campbell and Evans 1975, see 63.1).

d. **Baits.** No poisonous baits are registered for use on National Forest lands to control hare or rabbit populations.

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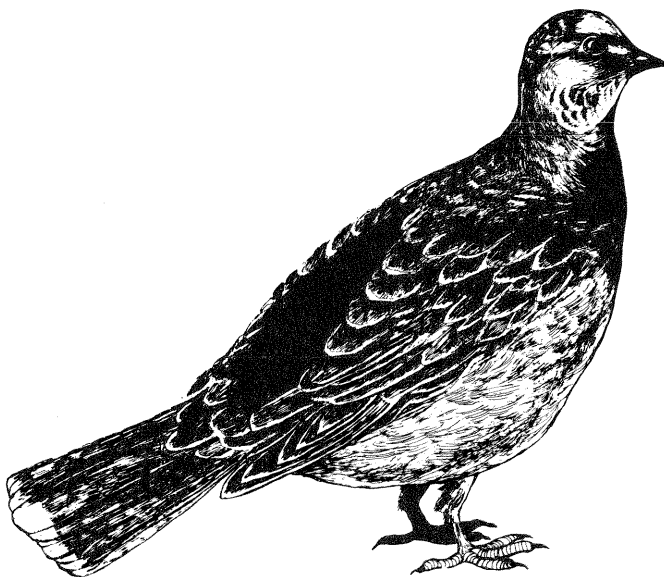
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53 - Birds53.1 - Blue Grouse (Dendragapus obscurus)

1. **Description.** Grouse are ground-dwelling, chicken-like birds. The blue grouse is dusky gray or blackish in color, with a light band at the tip of a black tail. Males have a yellowish-orange "comb" above the eyes. Females are grayish-brown and barred with black, and a blackish tail. Coloration distinguishes the blue grouse from the ruffed grouse and the spruce grouse.

2. **Economic Significance.** Blue grouse occur commonly from British Columbia to northern California. Although bud removal and clipping of needles occurs sporadically, it is far more extensive than had been realized in the past--budding often has been overlooked or more often misidentified as deer browsing. However, blue grouse usually remove only a few buds from each seedling. Thus, the impact of budding on small Douglas-fir seedlings may suppress height growth significantly (Black, et. al. 1978). The most serious grouse damage reported occurs in southwestern Washington.

3. **Life History Information**

a. **Preferred Habitat.** The blue grouse is found in coniferous forests, particularly in the winter.

The grouse nests and raises its young in nonforested areas, in native grasslands, or the early seral stages of a forest after logging or fire.

b. **Feeding Habits.** Young grouse feed primarily on grasshoppers and other insects during the first months of their lives. In the fall, berries, seeds, and succulent plant parts are consumed when available. During the winter and early spring, the diet consists primarily of conifer buds and needles, and occasionally mistletoe.

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c. **Activity.** Blue grouse are quite noticeable in the late spring when the males are "hooting" during the spring courtship period. During the summer and fall, the females and broods are noticeable at mid and low elevation on mountain and ridge slopes. In winter and early spring, blue grouse are usually found concealed in heavy coniferous cover at high elevations; during this period they seldom feed on the ground.

d. **Reproduction.** Five to 10 young are hatched per brooding female. The chicks stay with the hen through the fall.

4. Damage Problems and Their Control

a. **Identification.** Buds are neatly plucked from the stem, leaving only the inconspicuous point of attachment. Needle clipping may result in the removal of the entire needle or only a portion of it. The combination of irregular needle-clipping and clean removal of buds identifies the typical feeding of blue grouse (Figure 50.18).



Figure 50.18. Typical blue grouse damage.

b. **Determining Need for Damage Control.** Light damage can be tolerated without significant growth suppression. In localized areas with light grouse populations and with evidence of heavy damage on adjacent plantations, plastic tubes may be used to protect individual tree seedlings.

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c. Control Methods

(1) Large stock with good caliper (5-7 mm) and internodal buds will withstand considerable grouse budding and still be capable of good growth.

(2) Plastic tubing (Section 46.31) may protect small seedlings.

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53.2 - Bird Pests (Starlings and Sparrows)

1. Economic Significance.

Starlings and sparrows frequently take up residence in buildings, causing undesirable noise and droppings.

2. Damage Problems and Their

Control. Prevention is the best approach. Ledges and small crevices larger than 1-1/2 inches to 3 inches (3.8-7.6 cm) supply nesting sites for these birds. Holes around vents and gutters and unboxed eaves provide nest sites which could be eliminated when building or repairing.



Heavy screening can be placed on the outside of air vent holes before or after the nesting season is over.

Netting (see 46.22) can be effectively used to exclude birds from nursery beds.

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